

SOME MULTIPLE-USE PROBLEMS
ASSOCIATED WITH THE
ESTABLISHMENT AND MANAGEMENT
OF AZRAQ DESERT NATIONAL PARK

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To my wife, Hala,
and our twins, Zafer and Nancy

A C K N O W L E D G E M E N T S

I am particularly grateful to my academic supervisor, Dr. Ian Langdale-Brown for his untiring efforts in guiding me to a successful completion of this investigation. I also wish to thank him for his constant help, encouragement and constructive criticisms throughout the period of my studies.

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I am indeed grateful to my wife for her indispensable support and encouragement during the two years we have stayed in Edinburgh.

Finally, I am indebted to the British Council for granting me a scholarship to carry out this investigation.

D E C L A R A T I O N

I hereby declare that this thesis has been composed
entirely by myself.

MAHER ZAFER ABU JAFAR

A B S T R A C T

Most of the information in this thesis was gathered by reading literature and references; in addition pamphlets, reports and publications of the National Park section of the Ministry of Tourism and Antiquities and the Royal Society for Conservation of Nature, were considered.

Data were collected from field observation and fieldwork in the Azraq area, and by discussion with personnel concerned during the period May-July 1977.

This investigation was carried out in seven interconnected parts. Part 1 is concerned with the description of the natural characteristics of the Azraq Desert National Park. Part 2 of the investigation looks at the present land use in the Azraq Desert National Park. Fieldwork and interviews were conducted in Jordan's Azraq Desert National Park between May and July 1977, to assess the recreational and conservational use. The evaluation of the Azraq Desert National Park for the various land use forms is shown in Part 3. An investigation of the interactions between the various land uses in the study area is discussed subsequently in Part 4. Part 5 looks at the National Park movement in the U.S.A., U.K., and in Jordan, in addition to the IUCN definitions of National Parks and tries to identify the main problems of land use which hinder the establishment

and management of the Azraq Desert National Park. Part 6 looks at the objectives of land use and the proposed solutions to overcome them, and also considers overall strategy of administration of the Park. Recommendations for legislation are suggested to realise the proposed strategy. Finally, Part 7 deals with the summary and conclusions.

LIST OF EQUIVALENTS

LENGTH

| | | |
|------------|------|--------------|
| Millimetre | (mm) | 0.039 inches |
| Centimetre | (cm) | 0.394 inches |
| Metre | (m) | 39.37 inches |
| Kilometre | (km) | 0.621 miles |

AREA

| | | |
|------------------|-----------------------------|---------------------|
| Square metre | (m ²) | 1.196 square yards |
| Donum | | 1,000 square metres |
| Donum | | 0.247 acres |
| Hectare | (ha) | 10 donum |
| Square kilometre | (km ²) (sq.km.) | 0.386 square miles |

VOLUME

| | | |
|----------------------|-------------------|------------------|
| Cubic metre | (m ³) | 35.31 cubic feet |
| Million cubic metres | (MCM) | 8.077 acre feet |

WEIGHT

| | | |
|------------|------|-----------------|
| Kilogram | (kg) | 2.205 pounds |
| Metric ton | (MT) | 1,000 kilograms |
| Metric ton | (MT) | 2,205 pounds |

FLOW

| | | |
|--------------------|------------------------|-------------------------|
| Cubic metre/second | (M ³ /sec.) | 86.400 cubic metres/day |
| Cubic metre/second | (M ³ /sec.) | 35.31 cubic feet/sec. |
| Cubic metre/hour | (M ³ /hr.) | 4.4 U.S. gall./min. |

TEMPERATURE

| | | |
|------------------|-------|---|
| Centigrade | (°C) | $^{\circ}\text{C} \times \frac{9}{5} + 32 = (^{\circ}\text{F})$ |
| Part per million | (ppm) | |

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PART 1

DESCRIPTION OF THE
AZRAQ DESERT NATIONAL PARK

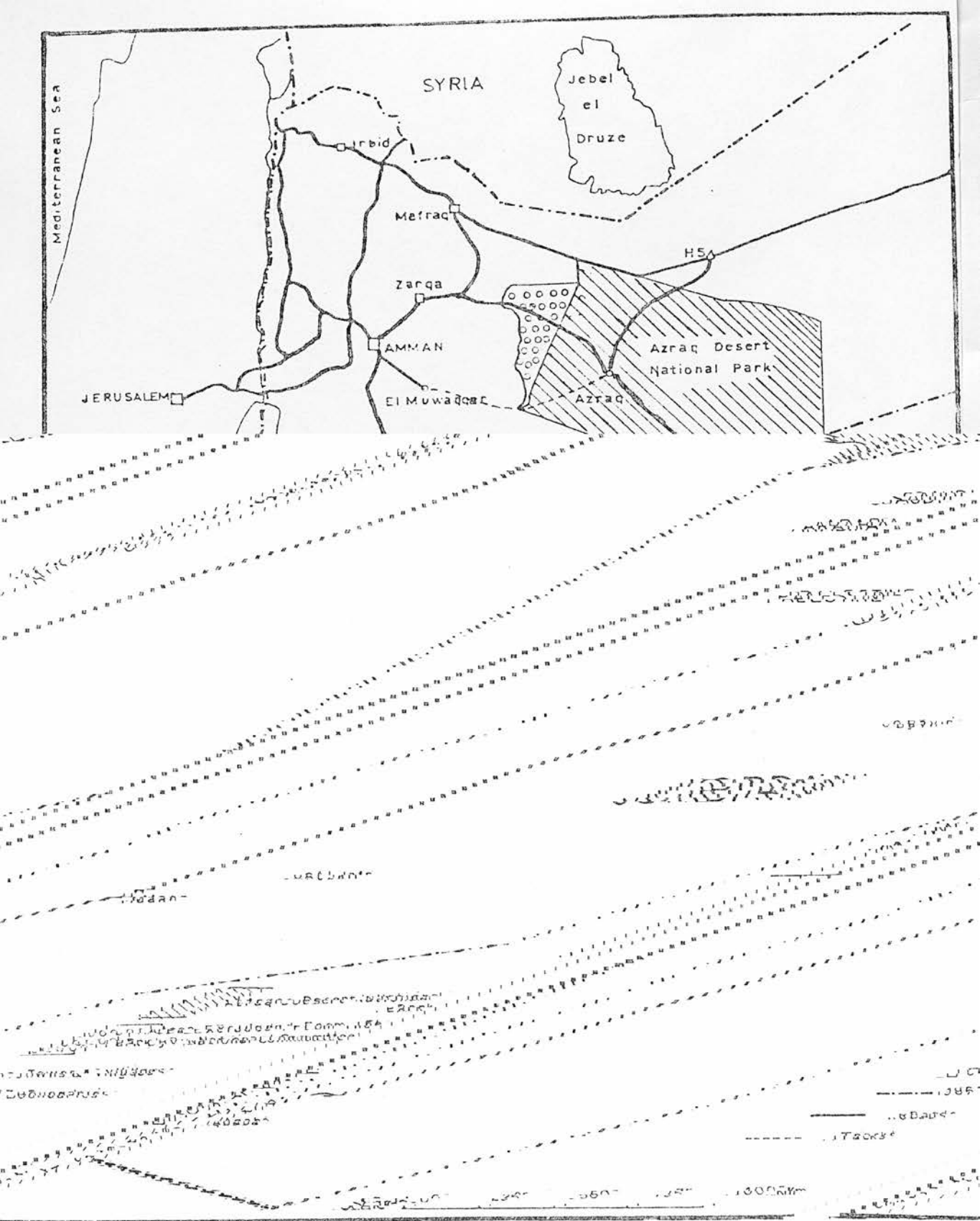
PART 1 : D E S C R I P T I O N O F T H E A Z R A Q
 D E S E R T N A T I O N A L P A R K

1-1 L O C A T I O N , E X T E N T , M A P A N D A I R P H O T O G R A P H I C C O V E R

1-1.1 L o c a t i o n a n d E x t e n t

The area designated as the Azraq Desert National Park is located in the Jordanian Desert. The latter is the western part of the great Syrian Desert which extends into Iraq and Saudi Arabia. The Park is centred around the Azraq Oasis 100 km. east of Amman (see Figure 1a). The boundary of the Park is generally defined as follows: in the north it is bounded by the Trans-Arabian pipeline road and the Mafraq-Baghdad highway, and in the south by the border between Jordan^{and} Saudi Arabia, and the track in a west-northwest direction to Qasr Kharana. To the east the Park boundary follows the north-south gridline numbered 36, whilst in the west it runs approximately from gridline number 28 south-southwest to Qasr Kharana (see Figure 1b).

The boundary of Azraq Desert National Park is defined in detail by Hemsley and George (1966). The boundary is marked on the ground by small pyramidal stone cairns set on the desert surface with cement base. The cairns are 1-1.5 m. high. They are not visible from each other. The area designated as the Azraq Desert National Park in 1965 was 5,250 sq.km. (Ca.2,026 sq. miles). During the 1970's a national committee considered the Draft



ՍՈՑԻԱԼԻՍՏԻԿԱՆ ԵՐԱՅԻՄԱՆ ԴԵՄՈԿՐԱՏԻԿԱՆ ՀԱՅԵՐԱՊԵՏՈՒԹՅԱՆ ԿԵՆՏՐԱԼ ԿՈՄԻՏԵ
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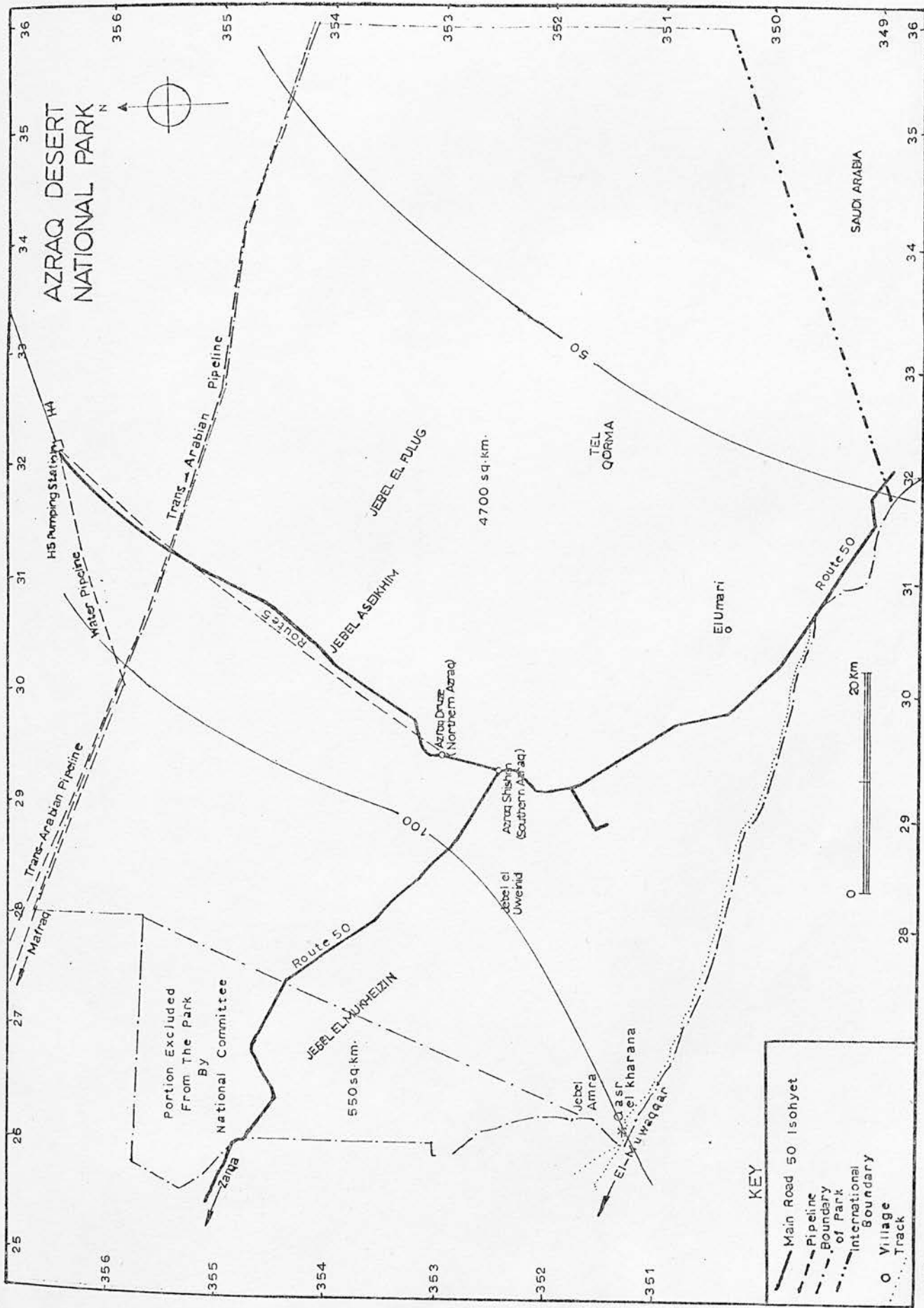


FIGURE 1b : Map shows the boundary of the Azraq Desert National Park and the Isohyet, (after Nelson, 1973).

Management Plan of Hemsley and George (1966), and attempted to reconcile some of the competing needs. As a result the extreme western portion of the Park, about 550 sq.km., was removed from further consideration, reducing the area of the Park to about 4,700 sq.km.

1-1.2 Topographic Maps and Aerial photography

1-1.2.1 Topographic Maps

The Park is covered by the following topographic maps:

- (a) Scale 1: 250,000 Sheet number NH37-1, NH37-2, NI37-13 and NI37-14.
- (b) Scale 1: 100,000 Sheet number NH37-A1, NH37-A2, NH37-A4, NH37-B1, NH37-B2, NH37-B3, NH37-B4, NI37-S5, NI37-S6 and NI37-T5,

published by the Army Map Service, U.S. Corps of Engineers.

- (c) Scale 1: 50,000 Sheet number 3353 I, 3353 II, 3353 III, 3353 IV, 3354 I, 3354 II, 3354 III, 3453 IV, and 3453 III,

published by the Army Map Service, the Jordan-U.S. Fund for Special Economic Assistance, 1964.

- (d) Scale 1: 125,000 Map 1 of the Azraq Desert National Park Draft Management Plan (1966).

1-1.2.2 Aerial photography

- (a) Scale 1: 25,000 vertical cover of eastern area of Jordan taken with panchromatic film in 1954 by Hunting Surveys Ltd.

- (b) Mosaics prepared from these photographs and currently lodged with the Military Survey.
- (c) Oblique photographs were taken from a helicopter at a height of 125 m. by the British-Jordan Expedition, 1965, to show views of the Azraq wetlands.

1-2 POPULATION

There are two villages in Azraq - Druze and Shishan. They are 7 km. apart. Azraq Druze is a closed community of about 202 families of Arab Druze who came by 1922 during the First World War from Jebel Druze in Syria (Nelson, 1973). Azraq Shishan has about 67 families of Chechen-Arabic stock and was founded in 1920 (Boyd, 1966). The total settled population in the Azraq Desert National Park was 1,930 in 1975 (Department of Statistics, Amman, Annual Report, 1975). It was made up as shown in Tables 1 and 2.

TABLE 1 : Settled Population

| Village | Male | Female | Total |
|--------------------------------|-------|--------|-------|
| Azraq Druze (Northern Azraq) | 746 | 699 | 1,445 |
| Azraq Shishan (Southern Azraq) | 262 | 223 | 485 |
| | 1,008 | 922 | 1,930 |

In addition, a further 56,000 nomads were dependent on the Azraq Desert National Park (Harris, 1958).

TABLE 2 : Nomadic Population

| Tribes | Tents number | Estimated population |
|------------|---------------|----------------------|
| Beni-Sakhr | 6,500 | 30,000 |
| Rwala | 4,000 - 5,000 | 23,500 |
| Sirhan | 400 | 2,500 |
| | Total | 56,000 |

The Beni-Sakhr is the largest tribe, whose land territory extends from El-Muwaqqar, south east of Amman to Wadi Sirhan in Saudi Arabia. Active men and boys accompany the migratory herds but the old men, women and children stay at home in the west in their cultivation zone.

The Rwala tribe lives in the south west of Syria in the summer (June - September), and moves in a N.W. - S.E. arc to pass through Azraq during October and November, grazing en route. They pass mainly through Iraq, on their way to their winter resort in Saudi Arabia. When returning to their home in Syria they pass through Azraq again (see Figure 2).

The Sirhan is a small tribe which lives in the Mafraq area in summer and moves near Ain el Beida in winter.

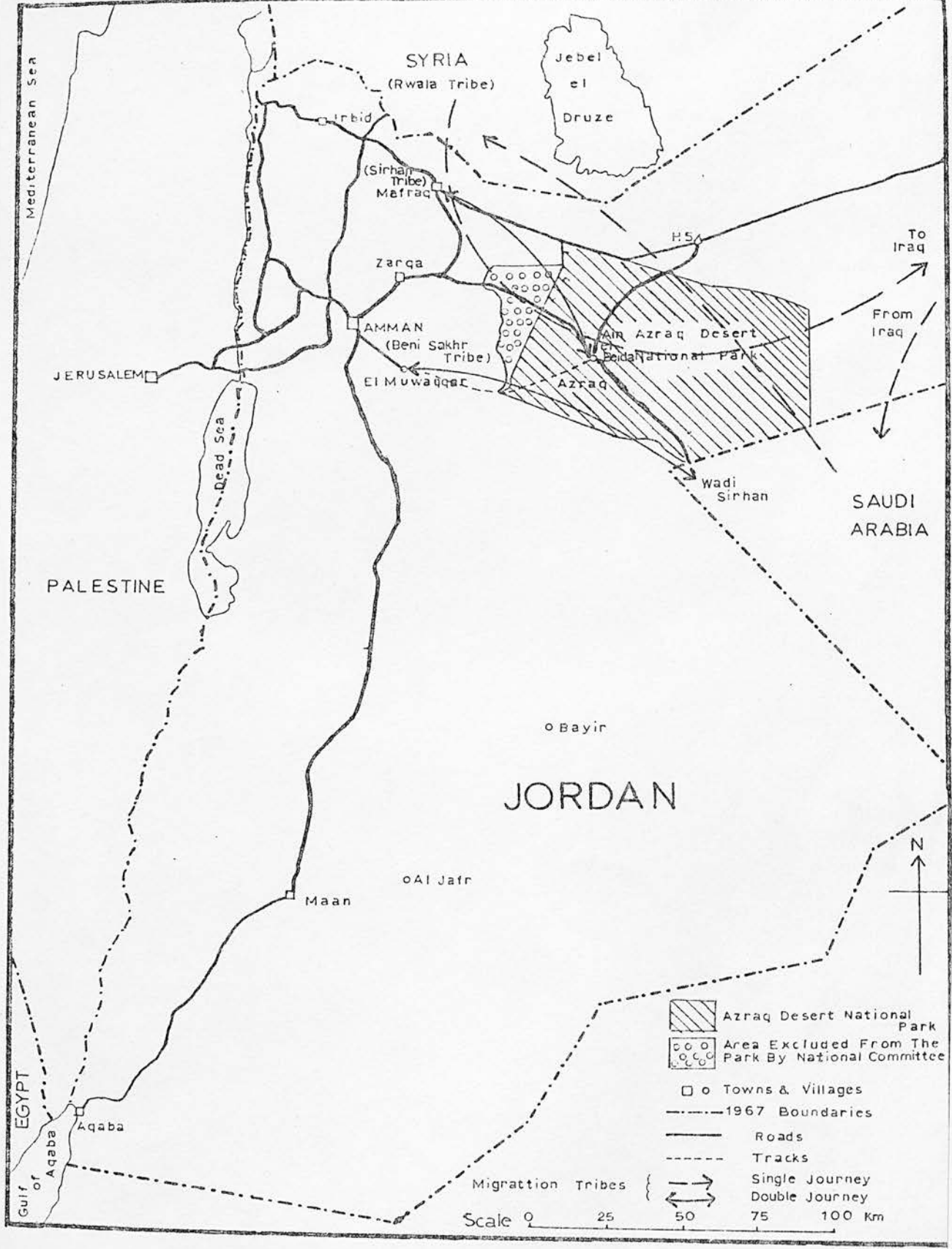


FIGURE 2 : Map shows the migration routes of Bedouin tribes within and outside the Azraq Desert National Park.

1-3 CLIMATE

Azraq Desert National Park lies in the desert, in the north-eastern part of Jordan, which is characterized by its clear sky most of the year. It has hot dry summers and cold winters with very little precipitation.

1-3.1 Temperature

Azraq has a wide range of temperature between summer and winter, as shown in Table 3. During the summer the weather is hot, the mean maximum temperature is ~~about~~ 37.1°C in August, and the highest daily range of temperature, ~~about~~ 18.6°C, occurs in July. Because of the aridity of the region and the dryness of the air near the eastern border of the Park, the annual absolute maximum temperature was 46.8°C, in 1963. In winter the air is very cold and dry especially during the night and early morning. Thus, the mean temperature for the coldest month, January, was 9.1°C while the minimum temperature was 2.9°C. The annual absolute minimum temperature was -8.8°C. Thus, in 1968, January was the coldest month and August was the hottest, as shown in Table 3.

1-3.2 Rainfall

Rainfall occurs mainly in the winter season with the heaviest falls in the period December - March, while there is no rainfall between June - September (vide Table 3). Sometimes the rains start in October or in late September and end in mid-May. By comparing different stations it can be noted that the annual

average amount of rainfall decreases as we move from west to east and from north to south.

The average annual rainfall at Azraq is 52.3 mm.

The 100 mm. isohyet crosses Azraq Park from southwest to northeast and the 50 mm. isohyet crosses Azraq Park from southeast to northeast (see Figure 1b).

TABLE 3 : Azraq Climatological Data, 1923-65, taken from the Jordan Climatological data Handbook (1968)

| Months | Mean Temp. °C | Mean Minimum Temp. °C | Absolute Minimum Temp. °C | Mean Maximum Temp. °C | Absolute Maximum Temp. °C | Daily Range Temp. °C | Rainfall mm. |
|-----------|---------------|-----------------------|---------------------------|-----------------------|---------------------------|----------------------|--------------|
| January | 9.1 | 2.9 | -8.8 | 15.0 | 28.0 | 12.1 | 8.4 |
| February | 10.2 | 4.4 | -6.8 | 16.4 | 31.4 | 12.0 | 10.4 |
| March | 13.8 | 6.9 | -1.9 | 20.5 | 35.3 | 12.6 | 6.6 |
| April | 18.5 | 10.7 | 2.8 | 25.8 | 42.4 | 15.1 | 2.9 |
| May | 22.7 | 14.2 | 3.8 | 31.4 | 44.1 | 17.2 | 1.4 |
| June | 27.2 | 18.5 | 10.2 | 35.6 | 45.3 | 17.1 | 0 |
| July | 27.9 | 18.4 | 13.8 | 37.0 | 46.1 | 18.6 | 0 |
| August | 27.7 | 19.0 | 13.5 | 37.1 | 46.8 | 18.0 | 0 |
| September | 25.2 | 17.0 | 10.0 | 34.3 | 42.3 | 17.3 | 0 |
| October | 21.0 | 11.4 | 1.0 | 29.8 | 38.5 | 18.4 | 1.5 |
| November | 15.9 | 8.1 | -5.0 | 23.4 | 34.1 | 15.3 | 4.6 |
| December | 10.5 | 4.7 | -7.7 | 16.9 | 28.5 | 12.2 | 16.5 |
| Annual | 19.1 | 11.4 | -8.8 | 28.6 | 46.8 | | 52.3 |

1-3.3 Humidity

During the winter season the relative humidity in Jordan is generally high - above 80% during January and February; but in the Azraq area the relative humidity is moderate, about 55%. During summer the relative humidity is generally low, but in the Azraq area it is much lower, usually below 5%.

1-3.4 Winds

The average speed of winds ranges from 10 to 15 km/hr (Baker, 1958). ^{Dry} ^ easterly winds prevail during the summer and are harmful to vegetation. The speed of the wind seems fastest in the afternoon.

1-3.5 Frost

Frost is infrequent in the Azraq area. Baker (1958) has stated that the frost-free period in Azraq is 300-330 days in a year.

1-3.6 Duststorms

Duststorms are very frequent in Azraq especially in summer; dust occurs 20-60 days in a year.

1-4 GEOLOGY, GEOMORPHOLOGY, AND SOIL

1-4.1 Geology

The following geological and geomorphological information have been culled from Nelson (1973) and Poore and Robertson (1964).

During Jurassic times the whole of the Jordanian Desert was covered with sedimentary rocks (limestone), but in the Miocene age the topmost sediments had probably been eroded and the basalt (lava) came from Jebel Druze to the south to cover the north-eastern parts of the Jordanian Desert, and finally petered out at Azraq Druze village.

There are two main geological formations within the boundary of the Azraq Desert National Park - limestone and basalt. The distribution is shown in Figure 3.

(a) Limestone: The southern part of the Azraq Desert National Park is mainly limestone. The limestone has been eroded into smoothly rounded uplands and gently undulating plains. The limestone area is covered by cherty and flinty Hammadas. Azraq Shishan is located in this region.

(b) Basalt: The basalt occupies the northern and extreme eastern parts of the Park. It consists of weathered basalt, ranging in size from large boulders to small stones. Most of this area is totally covered by boulders. Azraq Druze is located in this region.

1-4.2 Geomorphology

The landscape of the Azraq Desert National Park can be described under the headings of ^{the} two geological types:

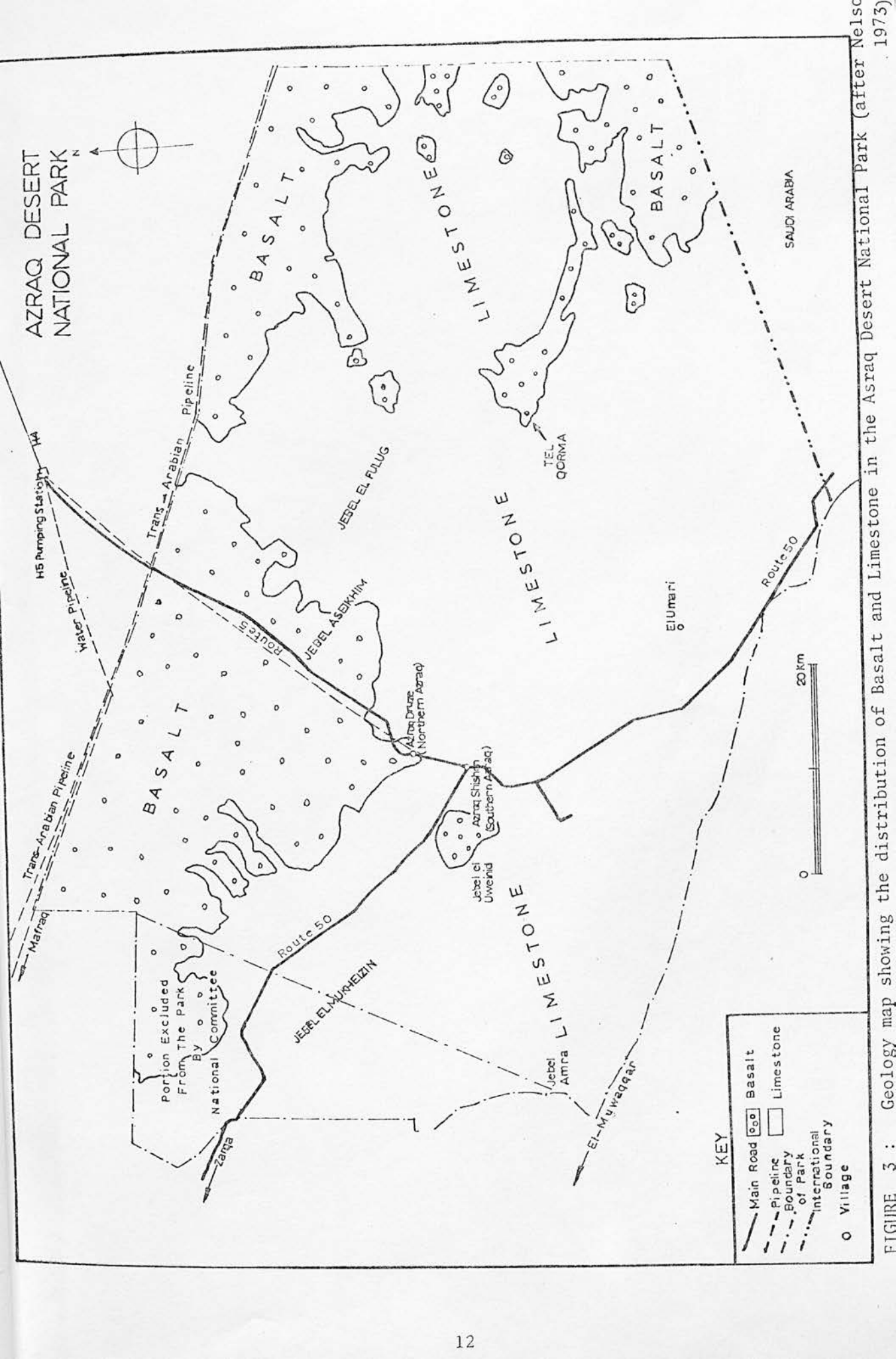
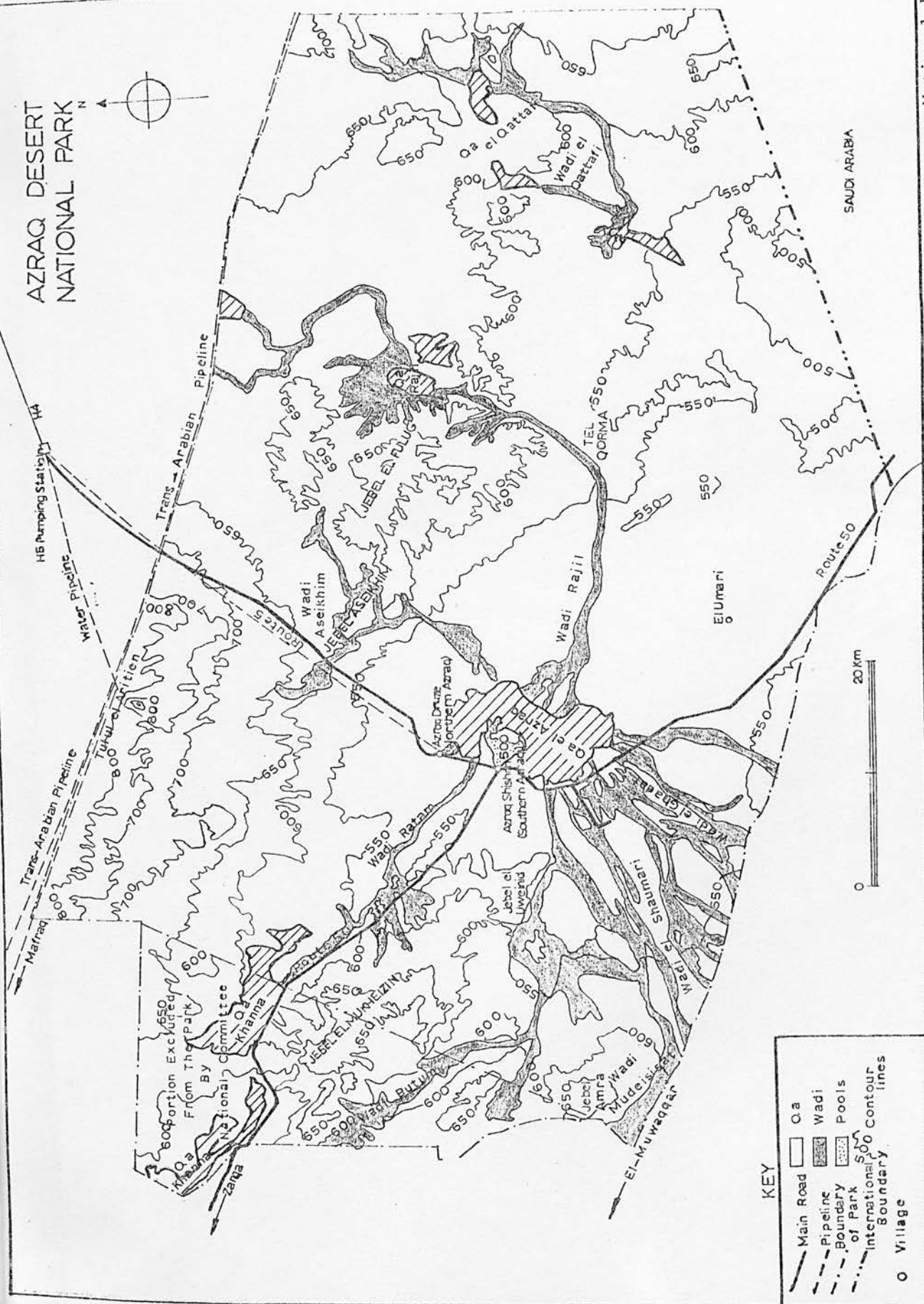


FIGURE 3 : Geology map showing the distribution of Basalt and Limestone in the Azraq Desert National Park (after Nelson 1973)

(a) Limestone Region: This region is characterized generally by lower lying undulating limestone strewn with weathered fragments of flint or chert. A large mudflat, called Qa el Azraq, (Qa is a word in Arabic for large inundations, while el merely qualifies Azraq) is found in this area at an elevation of about 500 m. above sea level. There are many small Qas scattered in the Park such as Qa Rajil and Qattafi in the east, and Qa Khanna in the west (outside the Park boundary). The wetlands constitute the Azraq Oasis. Around the Azraq Oasis the gravel strewn plain lies at a height of about 520 m., but the land southeast of El Umari rises slightly to form a shield between the Azraq depression and wadi Sirhan southeast to Saudi Arabia. The summit of Jebel Mukheizin (outside the Park boundary) rises to a height of 695 m. in the northwest of Azraq Shishan. There are more high grounds, about 650 m., around Jebel Amra in the southwestern corner of the Park, shown in Figure 4. The limestone hills of the park are dissected by the channels of many wadis (seasonal water courses), arranged in a dendritic pattern, which collect surface run-off water during the wet season (December-March). The water carries with it the products of erosion of these wadis, e.g. Rajil, Shaumari, Butum, Ratam and wadi el Qattafi.

(b) Basalt Region: The basalt area of the Park is hilly and shows a tendency to slope southwards and eastwards, attaining a maximum height in the north. The highest point in the Park is the summit of Tulul El Aritien, 928 m. To the northeast the



reliefs are more pronounced and rise into several hills (Tell Gorma, 550 m., Jebel El Fulug, 650m.). To the south of the main basalt area, there are several basaltic outliers, e.g. the Jebel El Uweinid, 550 m. The basalt region is drained by a number of wadis, but the dendritic pattern of these is less well marked than in the limestone region of the wadis Rajil, Aseikhim and Ratam.

1-4.3 Soil

According to Baker (1958) six soil associations can be recognised in the Azraq area. The distribution of these soils is shown in Figure 5, which is derived from a map prepared by Moormann, (1959).

1-4.3.1 Limestone Hammada Association

Grey desert soils - usually gravelly silt loams or silty clay loams in texture - predominate in this section.

This association consists of two units:

(a) Grey Desert Soils over Limestone chalk or gypsum:

This unit is to be considered as a true complex. The composition of the loose soil material varies greatly. The depth to the bedrock is very variable ranging from 0 to 50 cm. A further variation is caused by difference in nature of the bedrock. The flint cover is always very dense and mostly coarse to

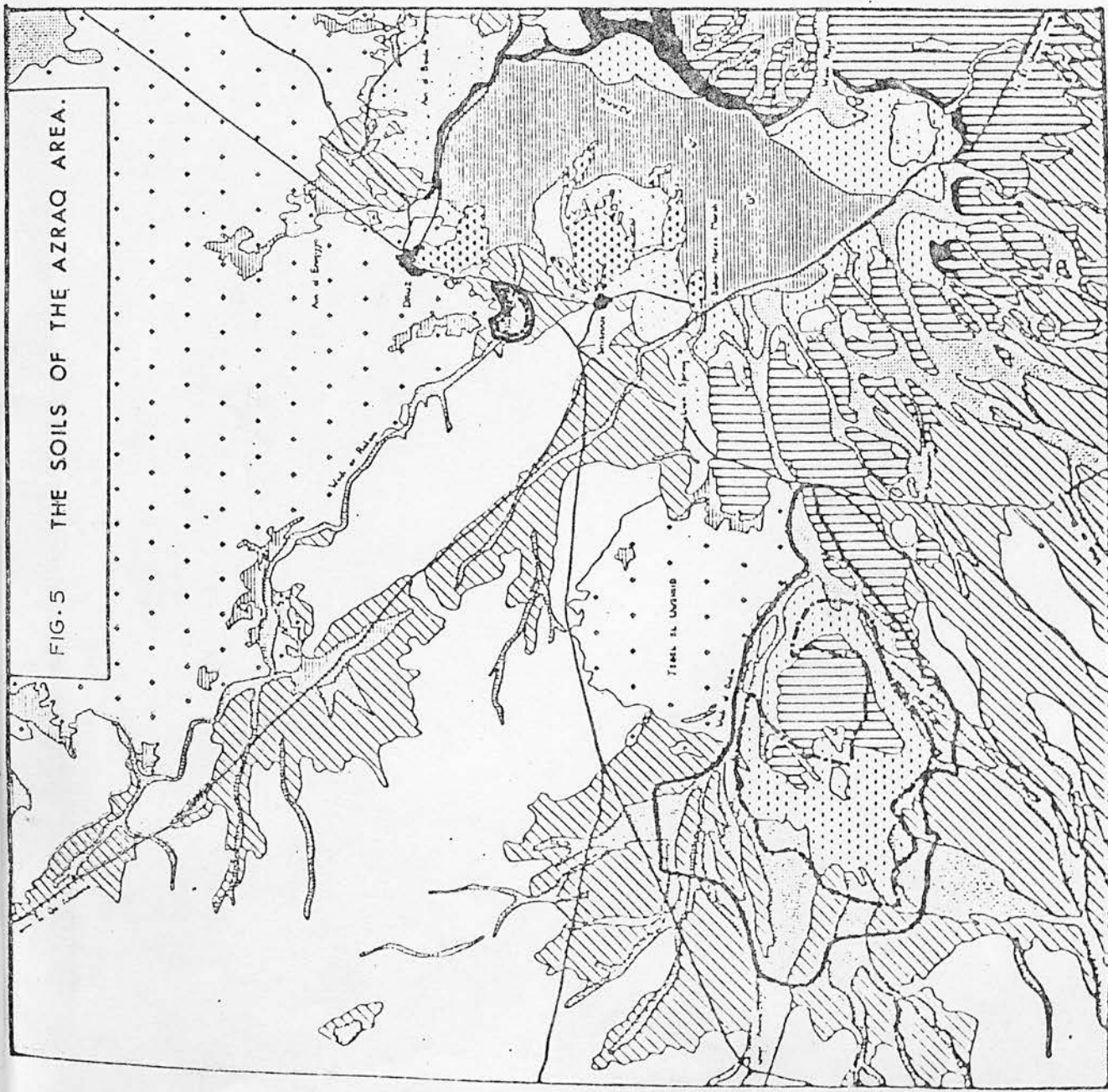


FIG. 5 THE SOILS OF THE AZRAQ AREA.

KEY



- Spring or well
- Settlement
- Pool
- Track
- Canal
- Grey Desert Soils over limestone chalk or Gypsum
- Grey Desert Soils on colluvium or old alluvial terraces
- Old lake shore deposits (Gypsum)
- Old lake bottom deposits (Gypsum and/or limestone)
- Clayey saline soil
- Saline silt loams
- Silt dunes
- Basalt Association (undifferentiated)
- Alluvial Association (")
- Wetland Association (")
- Boundary of areas soil surveyed in detail by the Princess Alia team
- Boundary of areas proposed for irrigation in the Princess Alia Report

Scale 0 1 2 3 4 5 Km.

FIGURE 5 : General Soil map - Azraq area, (from Moormann, 1959).

very coarse. The topography is definitely undulating to rolling. This unit is present in the northwest of the Azraq depression. The agricultural value of these soils is extremely low, even under irrigation.

(b) Grey Desert Soils on Colluvium or old Alluvial terraces:

This unit is fairly complex. Profiles range from gravelly to relatively silty soils. The amount of gypsum is variable and increases in general in the central depression. Calcium carbonate accumulation can be noted in this soil and gives rise to formation of hard cemented layers. These soils have a dense cover of flint and other stones. The topography of this soil ranges from relatively flat (alluvial material) to gently sloping (slope colluvium). In the southwest of Qa el Azraq, agricultural value of the land is low because of the presence of surface gravel. Irrigated agriculture is impossible because of the absence of silty soil.

1-4.3.2 Gypsum Association

This association consists of two units:

(a) Old lake shore deposit (gypsum):

This is found along the shoreline of Qa el Azraq in the north-eastern edges. These soils are characterised by variations within short distances. Most parts of the soils are gypsiferous. Salinity varies from slight to high. Textures range from gravelly sandy loam to clay. This soil has no potential for irrigated agriculture.

(b) Old lake Bottom - Gypsum Soils (gypsum/limestone):

This unit is fairly uniform in composition. The soils consist of relatively pure gypsum. Often the pure gypsum is covered with a shallow, silt-containing layer, but the gypsum crust may be found at the surface. These soils are slightly saline. Fine gravel flints occur on the surface. The soils with limestone at the surface or at shallow depth are overlain by a silt-loamy, very calcareous layer. Agriculture value is low in these soils and irrigation would cause local subsidence by dissolution of the gypsum.

1-4.3.3 Basalt Association

This association is found in the northern and extreme eastern edges of the Park boundary and in Jebel El Uweinid. Grey desert soils predominate, but the alluvial soils and solonchak occur in the wadis and on the saline mudflats. Basalt lithosols occur on solid basalt. The agricultural value is as variable as the soil profiles. Soil profiles here show defects (very stony and highly saline) and the drainage is difficult.

1-4.3.4 Alluvial Association

The soils of this association are situated in the northern and southern parts of the Azraq area. In the broader wadi bed the profiles are mainly silty with only a minority of gravelly profiles. In narrower wadis, the profiles are much more variable. Large variations are found in the salt content of the soils of this

association, and there is a general trend of increase of the salt content towards Qa el Azraq. But the salt content in the soils of wadi Butum near Qasr Amra is negligible, also the salt increases in some soils, situated south of Jebel el Uweinid. This association included solonchaks and Regosols on gypsum especially in the area lying south of Qa el Azraq. The ^{arable} agricultural value in wadi beds is low. There is grazing of the fairly dense vegetation.

1-4.3.5 Saline Soil Association

This association is found on the mudflats^{or} "Qas" of the Park which are flooded during the winter season (January-April). They dry out in May. The association consists of three units:

(a) Clayey Saline Soil:

This soil is found in Qa el Azraq and is so highly saline that the only vegetation is found near the edges and consists of halophytes.

(b) Saline Silt loams:

This soil is usually uniform in texture, although gypsaceous, gravelly or clay horizons. It sometimes occurs strongly saline near Qa el Azraq in the east, south and southwest, but becomes less saline away from the Qa in the south of Jebel el Uweinid.

(c) Silt dunes:

Silt dunes occur near Qa el Azraq and near the springs of Ain el Beida, Ain el Anoqiyya and Lion Spring. Provided water is available for irrigation the agricultural value of this soil is good.

1-4.3.6 Wetland Soil Association

The soils of this association are characterised by clay texture. They are located in the marshy areas around the pools of Druze and Shishan with high water table, a blue-grey colour, comparatively high organic content and are, for the most part, non-saline. Minor variation is known to occur both in soil texture and in the occurrence of small pockets of surface salinity. In general the soil of the Azraq area is poor but the area to the north and east of Azraq Shishan (silt dunes) is well vegetated and gives the best production of agriculture with the presence of water.

1-5 HYDROLOGY

The hydrologic studies of the Azraq area have been limited to the determination of discharges of the present springs in the Azraq area, utilisation of groundwater, and determination of precipitation averages and evaporation. From these can be determined the constancy of water production. The surface water resources of the Azraq Desert National Park are concentrated in the centre of the Park (Azraq villages) as follows:

1-5.1 Surface Water Resources

1-5.1.1 Springs

The water that flows into the pools and marshes is discharged from two main groups of spring - the Shishan springs and the Druze springs (see Figure 6).

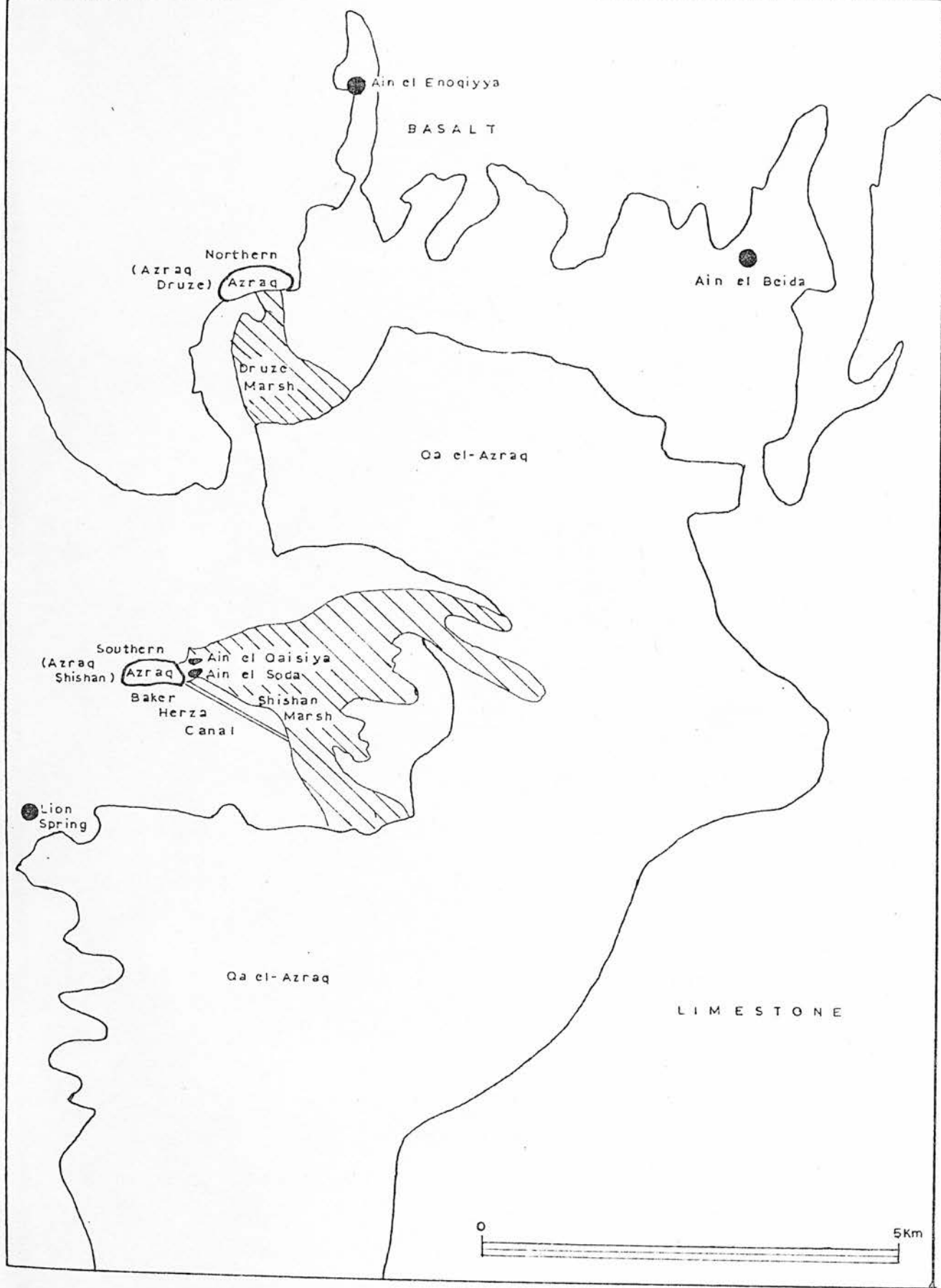


FIGURE 6 : Map showing Surface Water resources in the Azraq Desert National Park (from Nelson, 1973).

(a) The Druze Spring Group: This group consists of two separate springs (North pool and South pool) which discharge into separate pools. The surface area of the two pools is about 2,500 m². The water flows from the pools into Druze marsh 1½ km. to the south of Azraq Druze (Northern Azraq). The pools lie just below the basaltic plain of Azraq Druze village.

(b) The Shishan Springs Group: This group is composed of two springs (Pools).

1. Ain el Qaisiya: This pool lies in the east of Azraq Shishan (southern Azraq). Water comes from the bottom and sides of the pool. The surface area of the pool is about 4,200 m².

2. Ain el Soda: This spring lies to the south of Ain el Qaisiya. It has a surface area of about 2,300 m². Water comes from the bottom and the sides of the pool. The pools of the Shishan discharge into two canals and finally join into one canal which drains water into Shishan marsh about 250 m. to the east (see Figure 6).

(c) Baker and Harza Canal: In 1957 the Baker and Harza Company dug this canal from the Soda pool southeast to Shishan marsh. The canal is about 3.5 km. long. The main purpose of this canal was to measure the volume of water discharged from the Azraq Shishan pools (see Figure 6). Other artesian wells and springs found around the marsh are:

(d) Lion Spring: This is a natural spring which is situated about $3\frac{1}{2}$ km. southwest of Azraq Shishan (see Figure 6).

(e) Ain el Enokiyya: This is a small wetland area which is situated about 5 km. north of Druze village. The water discharges from an artesian well.

(f) Ain el Beida: This is a clear potable water which is situated about 10 km. east of Azraq Druze. The water discharges from an 8" pipe rising from an artesian well.

1-5.1.2 Qa el Azraq and other Qas

(a) Qa el Azraq: This great kidney-shaped mudflat has a surface area of about 50 - 70 sq.km. It forms the lowest point of the Azraq drainage basin and therefore receives, via the wadis which discharge into it, a very large amount of silt-laden run-off water. By the end of most wet seasons (March), this Qa floods to a depth of $1\frac{1}{4}$ m. Infiltration is extremely limited owing to the impermeability of the soil (see Plate 1). The mudflat is usually free from flood water by mid-May as a result of evaporation.

(b) Other Qas: There are many qas (mudflats) in the Park such as Qa Rajil and Qattafi. These qas are flooded by surface run-off water during the wet season and have usually evaporated by mid-May.



PLATE 1 :

Qa el Azraq in the flooding season

1-5.1.3 Wadis (seasonal water courses)

There are many wadis all over the Park. In the northern area (basalt), there are two wadis : wadi Ratam, and Aseikhim, running along the edge of the basalt area. They drain the northern area. The main wadis are in the limestone area such as wadi Butum, el Shaumari, and wadi el Ghadaf draining the western and south-western part. Wadi Rajuil is draining the eastern and north

eastern part. This drainage system carries water seasonally (December - March), and the wadis vary greatly in channel depth and extent (see Figure 4). There are three possible sources for the surface water in the Azraq area. These, as given by Baker (1958) and Nelson (1973) are:

1. The flows represent the collected and filtered precipitation of the Azraq depression itself. The filtrate is collected in sand and gravel deposit under the overlying basalt flows, or limestone and chert. The water seeps down through permeable rock and spreads through to collect in underground reservoirs at different levels and on different rocks. Then, after a long slow flow, it emerges where the basalt ends and the underlying limestone comes to the surface again.

2. The flows arise from deep lying aquifers. The underlying aquifers are complicated. It has been checked by sampling and analysing water from boreholes and different areas throughout the Azraq basin. The indications are that Azraq water makes a long underground journey before it rises to the surface. By using dating techniques it has been estimated that 10 - 50 years elapse between rainfall and the reappearance of the water.

3. The flows represent catchment from Jebel Druze in the north. Mudallal (1967) has shown that the major recharge to the aquifers is from the Syrian Jebel Druze, where the rainfall is sometimes 1,000 mm/year. This falls on fractured basalt, infiltrates

quickly and is able to flow easily through the channels found in this rock. He goes on to say that the channels in the basalt layer at Azraq are in direct contact with those of Jebel Druze, and the rock has very similar qualities and formation. He added, some water may be expected to pass slowly down into the basalt from wadis during rainstorms in the basin. Mudallal says that no recharge takes place from the qas because they are highly impermeable. Azraq water is probably recharged through the basalt from Jebel Druze, Southern Syria, mainly as underground water and also from flash storms and floods from precipitation over the area.

1-5.2 Sub-surface Water

1-5.2.1 Aquifers

According to Mudallal (1967) there are three different aquifers in the Azraq Desert National Park, as shown in Figure 7: shallow B4, intermediate B3, and deep aquifer B2. The intermediate and deep aquifers are recharged from deep lying aquifer. The shallow and possibly some of the intermediate aquifers (depth less than 200 m.) are partially recharged by rainfall in the Azraq catchment area.

(a) B4 Aquifer: The formation of this aquifer is basalt rocks. The depth of water level ranges from 1.58 m. in Azraq 12 Well to 211 m. below ground surface in Tapline 6A, from basalt. The total dissolved salt (T.D.S.) in this aquifer system ranges from 255 ppm. (AZ-12) to 4,000 ppm. (AZ-13). The yield of the wells in this aquifer system is good. This aquifer is good and gives a high yield of good quality (potable) water.

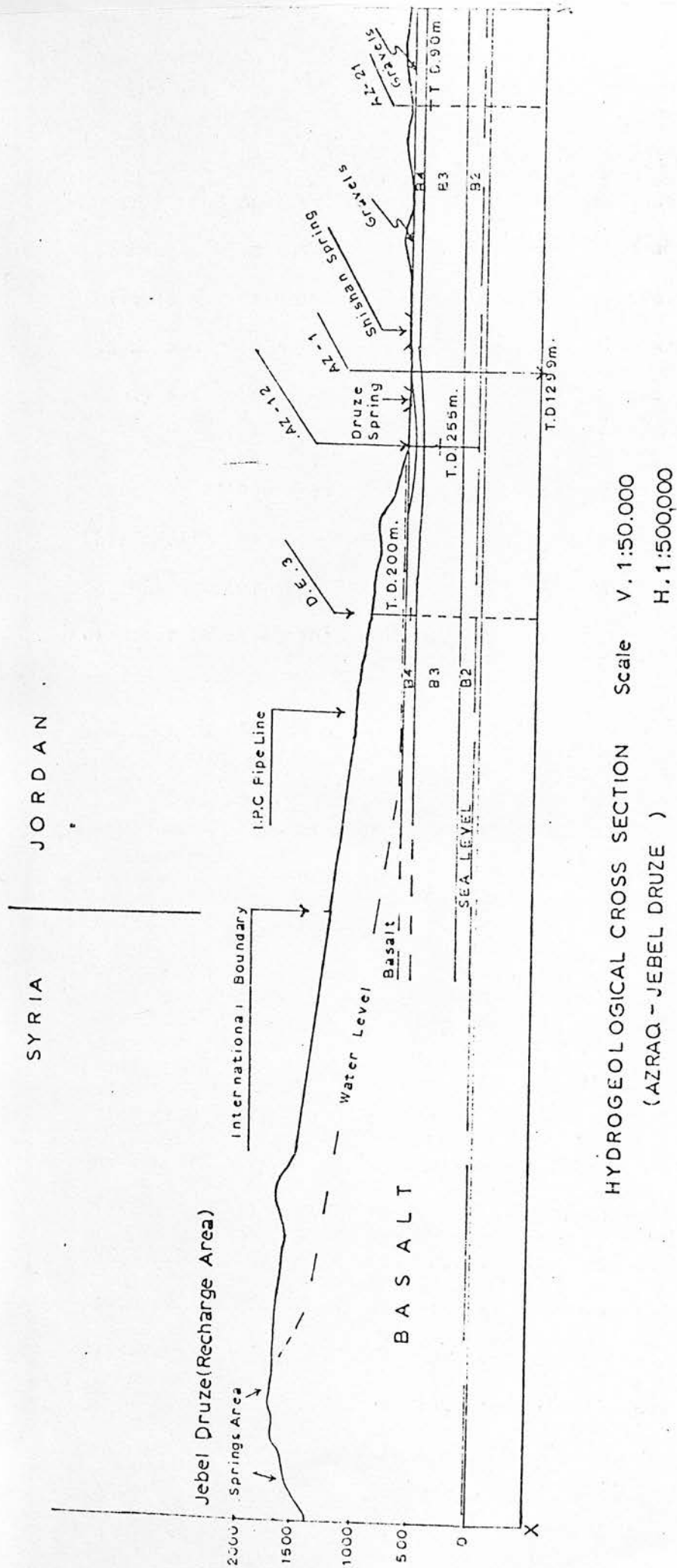


FIGURE 7 : Distribution of sub-surface water (Aquifers) between Jebel Druze and Azraq, (from Mudalial, 1967).

(b) B3 Aquifer: The formation of this aquifer is chalky bituminous limestone. This aquifer is saline and therefore not suitable for drinking. The depth of water level ranges between 6.6 m. and 81.0 m. below ground surface. The water quality is mainly saline and the yield of the wells is low.

(c) B2 Aquifer: The formation here is chert and chalk. This aquifer has been proven to be a good aquifer. The (T.D.S.) in this aquifer system is 1,200 ppm. (AZ-2). The average depth of water level in this well is about 70 m.

1-5.2.2 Wells and boreholes

More than 110 wells have been drilled in the Azraq area resulting in about 11,200 m. of drilling. These wells were drilled by the Baker and Harza Company, the Water Resources Department, a UN-project and Natural Resources Authority (N.R.A.). Baker and Harza drilled 26 wells to a total depth of 3,807 m. Four wells were drilled in Shishan village area: PA-1, PA-1A, PA-2, and PA-6, shown in Figure 8. Fifteen were drilled in wadi Butum area, four wells in wadi Ratam, PA-3, PA-4, PA-5 and S-12, and two wells at Hababiya (outside the Park). The UN-project drilled 29 wells with a total depth of 2,591 m. in the Azraq area. The N.R.A. drilled one well, DE-3, to a depth of 200 m., about 25 km. north of Azraq Shishan - this is to explore the basalt aquifer extension. About 55 wells were drilled in the north eastern part of Azraq Druze (silt dunes area) to establish new modern farms and each farm has its own well. This area is about 110 sq.kms.

Z



29

1-5.2.3 Water Quality

Several factors affect water quality. These include:

(a) The location of water source, whether springs or boreholes. This affects water quality because the salinity is much less further to the north towards the basalt aquifer, away from salt accumulation area. Thus T.D.S., of Druze springs, are 335 ppm for the north pool and 345 ppm for the south pool. Also Azraq Shishan, 7 km. south of Azraq Druze, the T.D.S. for the north pool (Ain el Qaisiya) are 750 ppm and for the south pool (Ain el Soda) are 1,292 ppm.

(b) The lithological properties of aquifer from which the water issues has an important effect on water quality. Hence the B4 aquifer (basalt) produces water of good quality while the B3 aquifer (chalky bituminous limestone) produces saline water.

(c) The characteristics of the medium through which the water percolates affect the water quality. High salinity is related to the direct contamination of the ground water by the large bodies of salts accumulated in the area as a result of evaporation. The velocity of water in the permeable beds is greater than that in the less permeable beds. The faster the water movement in the respective rocks, the better the water quality. In general the quality of spring water (in Shishan and Druze) is good. The quality of ground water in the area is variable from poor to good, with the better

quality water to the north and northeast (basalt area) and in some areas to the southwest (limestone area).

1-6 FLORA

The Azraq flora displays adaptations for survival under severe conditions. These include resistance to the loss of water by means of reduced leaves, thick and silvery bark, wax-coated leaves, deep roots, speedy flowering, highly resistant seeds, water shortage by bulbous roots and succulence. Three factors affect the distribution of the flora within the Azraq Desert National Park: geology, geomorphology and rainfall. The last-named is probably the most important factor due to the very low annual precipitation within the Azraq Park. The vegetation cover of the Park ranges from aquatic plants in the Azraq wetlands (pools) to a very sparse vegetation cover in the flint-hammada desert. Wadis are well vegetated because of the moisture from seasonal drainage. The basalt area supports a sparse cover of semi-woody perennials, herbaceous perennials and annual plants. The basalt-limestone hammada transition zone has a richer flora. Reviewing the work of Poore and Robertson (1964), Hemsley and George (1966) and Long (1957) distinguished seven habitat categories for the Azraq Desert National Park.

1-6.1 Openwater and Wetlands Communities

The main permanent openwater occurs in Shishan and Druze pools. In Shishan marsh there are submerged aquatic plants including Zannichellia palustris, Ruppia maritima, and Chara tomentosa. Four important species appear in the marsh, such as Arundo donax (giant reed) up to 2 m. height and forms a dense stand in the northeastern part of the areas, (see Plate 2).



PLATE 2 :

Azraq Shishan pool: Reed swamp of Typha angustata and Arundo donax in the openwater of Shishan pool

Phragmites communis (cane reed) is an important species in Shishan marsh, and Juncus acutus (Prickly Sea rush). Other species occur in shallow water such as Cyperus laevigatus, Juncus gerardi and Eleocharis palustris. In the western part of the marsh there is a pure stand of woody shrub Tamarix jordanis at a height of 3 - 4 m. Druze marsh consists of the same species as Shishan marsh, such as Typha angustata, which is available at the mid-western borders of the marsh. Juncus acutus and Juncus maritimus, which are scattered in the upper marginal sites of the marsh, while Cladium mariscus occurs on the deeper outflow from Azraq pumping station to the Qa. Several species occur in good condition at Ain el Enokiyya and are not seen elsewhere. Examples are free-floating Lemna gibba mixed with Cyperus laevigatus and Apium nodiflorum, Veronica anagallis-aquatica and Juncus fontanesii. At the lowermost levels of both Druze and Shishan marshes there is a series of salt tolerant species, including Juncus gerardi, Eleocharis palustris, Spergularia marina, Spergularia media, Scirpus maritimus, Cyperus laevigatus, Aeluropus littoralis. On less saline sited area is Carex divisa and sometimes Juncus bufonius. Many species available at the water holes of el Umari include Ruppia maritima, Cyperus laevigatus and Juncus maritimus and good quality of Asparagus palaestinus.

1-6.2 Mud-flats (Qas)

Two main types of mudflats (Qas) are in Azraq - vegetated qa and unvegetated qa. Qa el Azraq represents the first

type, it is a saline mudflat and consists of succulent halophytes, e.g. Halocnemum strobilaceum and Halopeplis amplexicaulis, which are pinkish in colour. Other typical species are in the southwestern parts of Qa el Azraq, such as Suaeda vermiculata, Salsola tetrandra and Frankenia aucheri. The eastern side of this Qa consists of more rapidly drying saline flats and carries an extensive cover of Halocnemum strobilaceum. Some species spread to the muddy depression in the hammada to the east of Azraq Druze. These include Spergularia spp., Frankenia pulverulenta, Psylliostachys spicatum, Matricaria aurea, Trigonella uncata, and the grass Sphenopus divaricatus. Qa el Fara and the western side of Qa el Khanna (see Figure 9) are a good example of unvegetated Qa. The absence of plants here is due to high impermeability of soil and the plants seem to be unable to tolerate the excessive dryness during the summer months. In Qa el Umari, southeast of Azraq Shishan, some halophyte communities occur. Examples are Frankenia aucheri, Aeluropus littoralis and a few Limonium carnosum.

1-6.3 Nitraria-Tamarix Communities on Saline Alluvial Soils

These species occur in silty dune soil which surrounds the Shishan wetland and is to the northeast of Qa el Azraq. The pale soil around the Shishan wetland is characterised by Nitraria retusa-Tamarix macrocarpa shrub at a height of 2 - 3 m. with a pile of blown silt on the base of these shrubs. The flat area between these piles supports a fair vegetation of herbs (grass). Shrublets, such as Imperata cylindrica, Aeluropus littoralis and Polypogon monspeliensis are common along with Spergularia spp., Frankenia aucheri,

Alhagi mannifera, Prosopis frakta, Erodium spp., Centaureum spicatum and Juncus acutus. Tamarix-Nitraria occur also to the southeast of Qa el Umari.

1-6.4 Wadi System Communities

These are an extensive series of surface drainage lines meeting in Qa el Azraq from different directions of the Azraq Desert National Park. Figure 9 shows that the largest wadi spread occurs in the lower part, e.g. wadi Butum, Shaumari, Rajil, el Ratam and Aseikhim. They are associated with the drainage from the western and south-western parts of the Park, but wadi Qattafi runs across the southeast corner of the Park as an independent system. Most of the species listed earlier occur in all the larger wadis with little variation from wadi to wadi. Most of the plant species are dwarf shrubs and perennial herbs. The common species in wadi Ratam are Retama raetam, Artemisia herba-alba, Atriplex halimus, Salsola tetrandra, Achillea fragrantissima, Seidlitzia rosmarinus, Anabasis articulata, Haloxylon salicornicum, and more locally, Prunus arabicus. There are also many species of annual and perennial herbs, e.g., Capparis spinosa, Eryngium glomeratum, Phlomis brachyodon, Calligonum comosum, Zilla spinosa, Lactuca orientalis, Euphorbia microsciadia, Prosopis farcta, and Ephedra transitoria, (see Plate 3).

The woody plant, e.g. Pistacia atlantica, trees occur in wadi Butum to a height of more than 10 m. (see Plate 4).



PLATE 3 :

Wadi Ratam: The vegetation of wadi Ratam consisting mainly of Retama raetam on the wadi bank



PLATE 4 :

Wadi Butum: Old trees of Pistacia atlantica believed to be about 400 years old (Beshar, pers.comm.)

In addition to the dwarf shrubs listed above there are many larger perennials, including Anabasis setifera, Salsola rigida, and scattered Astragalus spinosus, and annual herbs including Polygonum equisetiforme, Spergularia diandra, Reseda decursiva, Launaea nudicaulis, Leyssera capillifolia, Gymnarrhena micrantha, Trigonella stellata, Gasoul nodiflorm, Aizoon hispanicum, Roemeria hybrida, Asteriscus pygmaeus, Spergula fallax and Notoceras bicornae. A branch of wadi Rajil, about 2 km. west of Tell Gorma, is dominated by Retama raetam. In addition, many species occur in wadi Rajil but not elsewhere, e.g. Emex spinosus, schimpera arabica, Silene arabica, Plantago boissieri, Brassica tournefortii, Astragalus gyzensis, Picris sulphurea, Hypecoum deuteroparviflorum and Launaea mucronata; and grasses, e.g. Cutandia dichotoma, Bromus sericeus and Aristida plumosa.

1-6.5 Open Scattered Dwarf Shrub-Perennial Herb Association

This category covers limestone hammada desert but excludes the wadis and small seasonal drainage lines. The vegetation cover here is very sparse or non-existent, because of a long history of grazing and browsing by the stock of nomadic pastoralists. The predominant dwarf shrubs are Artemisia herba-alba, Anabasis articulata, Haloxylon salicornicum, Haloxylon articulatum, and other Chenopodiaceae. There are some annual herbs and some larger perennials, e.g. Ferula communis and Rheum palaestinum. Other species occur in this habitat, e.g. Trigonella stellata, Papaver rhoeas, Erodium deserti, Plantgo amplexicaulis and Astragalus corrugatus.

1-6.6 Rocky, Stony or Similar terrain with Annual Plants
(Perennial species not conspicuous)

This category occupies the elevated country to the west of Azraq, Jebel el Mukheizin, Jebel el Uweinid, Jebel Aseikhim, and Jebel el Fulug in the northeast and the upland between Jebel el Aseikhim and Tell Qorma. Some erosion occurs in the steep slope and in some places the ground surface is without any vegetation cover. In the steppe grassland both the grass, Poa sinaica and Carex stenophylla, are present. In these barren tracts the annual species can survive due to storage of water, e.g. Gasoul nodiflorum and Aizoon hispanicum. Other common species are Asteriscus pygmaeus, Leyssera capillifolia, Pteranthus dichotomus, Gymnarrhena micrantha, and more locally, Scorzonera mollis, which has bulb-like roots for water storage.

1-6.7 Vegetation of Rocky or Stony basalt

The vegetation of this category covers the northern and eastern parts of the Park. Plants occur where stones are not too thickly scattered, and where a silty soil is present. The edge of the basalt has a unique flora in three locations, namely Azraq Druze, wadi el Ratam and Jebel el Uweinid. The plants include Carthamus nitidus, Ducrosia flabellifolia, Umbilicus intermedius. The sub-shrubs of the basalt are Seidlitzia rosmarinus, Anabasis articulata and Lyeium depressum. The herbaceous plants on the basalt are Gasoul nodiflorum, Aizoon hispanicum, Pteranthus dichotomus, and Spergularia diandra. Areas of the basalt near the Trans-Arabian pipeline in the northern border of the Park have many species such as Achillea fragrantissima, Artemisia herba-alba, Capparis spinosa and Salsola vermiculata.

Little is known about the original flora in the Park area but it is probable that the whole area was once covered with Pistacia atlantica, Kasapligil (1956). After the Ottoman invasion of Arab countries they destroyed the woodland and used the wood for building railway lines and as fuel.

The most interesting communities within the mentioned categories are:

(a) Openwater and Wetlands

These conditions produce a very interesting community due to the presence of water, which is very rich in flora, especially aquatic plants and reeds. Reeds also have an economic importance because some villagers engage in reed-cutting to produce cheap mats. This wetland receives international recognition as a waterfowl habitat.

(b) Another interesting community is wadi system and the small drainage lines, especially in wadi Butum. It contains old trees of Pistacia atlantica associated with Retama reatam. This wadi was a big forest of 15 km. long by 40 - 80 m. wide. The average age of this forest is estimated at about 400 years. Qasr Amra (consisting of a hunting lodge and baths) is situated in the extreme end of wadi Butum forest, probably for hunting and securing fuel for the baths during the Omayyad period around the 8th Century.

Azraq Desert National Park is very rich in fauna because it contains a number of habitat type such as fresh water, mudflats, open rocky country, hills and wadis. Generally the fauna is divided into two categories (see Figure 10).

1-7.1 Invertebrates

Information is presented on Azraq invertebrates by Nelson (1973). The invertebrates of Azraq are mostly present in the open water (Shishan and Druze pools) and mudflats (Qas). They include Protozoa (plankton), Annelida (leech), Mollusca (snails), Nematoda (roundworms), Crustacea, Cladocera, Copepoda, Amphipoda (fish water shrimp), Decapoda. Insecta: Thysanura (springtails), Odonata (dragonflies), Hemiptera (bugs), Diptera, Lepidoptera (butterflies and moths), Coleoptera (beetles), Orthoptera, Arachnida (spiders, mites and scorpions).

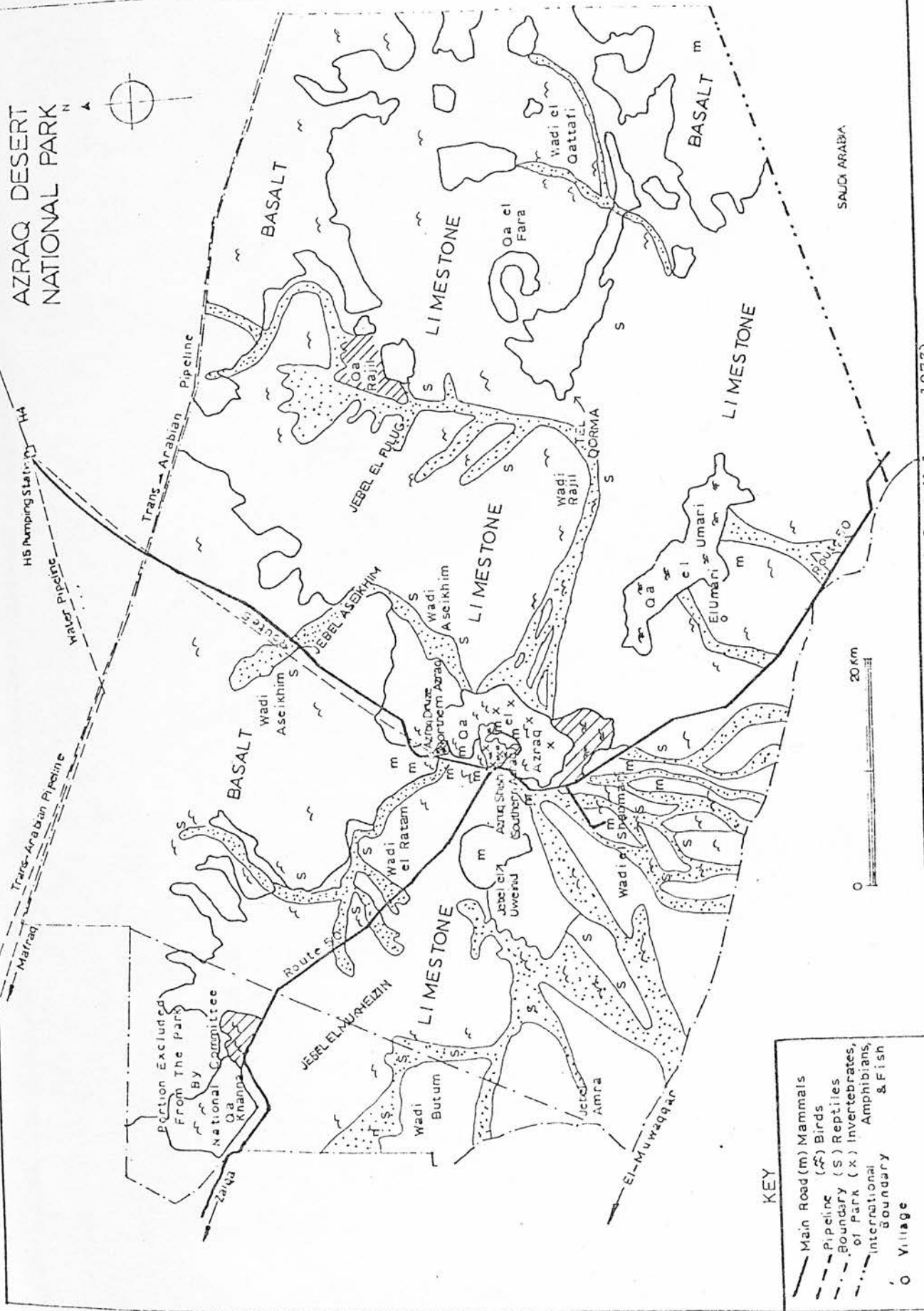
1-7.2 Vertebrates

The vertebrates of Azraq include the following:

1-7.2.1 Mammals

This information has been collected from Harrison (1964, 1968 and 1972) and Nelson (1973). Sixty-nine species have been recorded in Jordan but five of these are ^{now} locally extinct. These five are, Brown bear, Ursus arctos, Asiatic lion, Panthera Leo persica, Arabian Oryx, Oryx leucoryx, Fallow deer, Dama dama and Syrian Wild ass, Equus hemionus hemippus. The sub-species mentioned are

AZRAQ DESERT NATIONAL PARK



SAUDI ARABIA

KEY

- Main Road (m)
- Pipeline (s)
- Boundary (s)
- Boundary of Park (x)
- International Boundary
- Village (v)
- Mammals (m)
- Birds (b)
- Reptiles (s)
- Invertebrates (x)
- Amphibians (a)
- Fish (f)

Figure 10. Fauna distribution at the Azraq Desert National Park (after Nelson, 1973).

probably entirely extinct. The future of the most important species in the Park is very uncertain and ^{they} may be regarded as endangered species. Nelson (1973), confirms this status.

(a) Carnivora

1. Striped Hyaena, Hyaena hyaena syriaca lives in Azraq in open rocky country, in the marshes, and appears at Azraq village at night attacking livestock of the village. It is also found in the remote area of the basalt ridges such as Jebel el Uweinid in the impenetrable caves.

2. Asiatic Jackal, Canis aureus syriacus, is common around Azraq, living and breeding in the marsh and its fringes. The animal feeds on the abundant frogs, catfish, carrion, and small birds and mammals.

3. Fox, Vulpes vulpes arabica, is also common around Azraq, feeding on carrion which it may share with the hyaena.

4. Wolf, Canis lupus. A few remain in the area and could be retained as an interesting part of the Park fauna.

5. European wild-cat, Felis silvestris. There are some individuals of this species in Azraq.

6. Caracal (Sand-cat), Felis caracal. A rare species in Azraq.

(b) Artiodactyla

1. Arabian gazelle, Gazella gazella arabica. Gazelles seem to have been still abundant in the Park at the time of the Second World War, but the hunters, often from neighbouring countries, hunted the gazella with automatic weapons and modern vehicles. Clarke (1977) states that it is doubtful whether any surviving gazelles in the Azraq area would be found today.

2. Gazella leptoceras - may be present in the sandier terrain near the south-eastern corner of the Park. The following is a list of mammals from Atallah's report (1966), and Nelson's observation in Azraq:

(c) Insectivora

1. Ethiopian hedgehog, Paraechinus aethiopicus. It is common in Azraq.

2. Savis pygmy shrew, Suncus etruscus. Occurs near Shishan village.

3. Common European White-toothed Shrew, Crocidura russula monacha. It is common in Azraq.

(d) Chiroptera

1. Kuhl's pipistrelle, Pipistrellus kuhli ikhivanius. Common in Azraq.

2. European free-tailed bat, Tadarida teniotis rupelli.
occurs in Azraq Druze village and Faidhat Edh Dhahikiya. .

3. Hemprich's long-eared bat, Otonycteris hemprichi jin.
occurs in Shishan village.

(e) Lagomorpha

1. Arabian hare, Lepus arabis arabis. It is common
in Azraq.

(f) Rodentia

There are 11 rodents in Azraq Park.

1. Three-toed or lesser Egyptian jerboa, Jaculus
jaculus vocator. It is common in Azraq.

2. Five-toed or Euphrates jerboa, Allactaga euphratica.
This is much rarer than the vocator.

3. Southwest Asian garden dormouse, Melanurus melanurus.
This species is rare in Azraq Druze.

4. House-mouse, Mus musculus. Common in occupied and
derelict dwellings, and in gardens.

5. Golden spiny mouse, Acomys russatus. It is common in
Azraq.

6. Wagner's gerbil, Gerbillus dasyurus dasyrurus, is common in Azraq.

7. Pygmy gerbil, Gerbillus henleyi mariae. This is rare in Azraq.

8. Tristram's jird, Meriones tristrami, occurs in Druze and Shishan gardens.

9. Libyan jird, Meriones libycus syrius, is common.

10. Sundevall's jird, Meriones crassus crassus, is common.

11. Fat sand rat, Psammomys obesus terrae-sanctae, is common.

(g) Domesticated Mammal

There are nine species of domesticated mammals at Azraq.

1. Dog, Canis familiaris.

2. Cat, Felis chaus.

3. Donkey, Equus asinus.

4. Horse, Equus caballus.

5. Camel, Camelus dromedarius.

6. Domestic cattle, Bos gaurus and Bos indicus.

7. Goat, Capra hircus.

8. Water buffalo, Bubalus bubalus.

9. Sheep, Ovis aries.

1-7.2.2 Birds

Recent studies on the birds have shown a varied fauna. Mountfort (1966) recorded 200 species of birds of which 60 are resident, including a number of aquatic fowl. Nelson (1973) recorded 287 species belonging to 41 families of which 118 species are migrants, 109 are vagrant, 6 are migrant or vagrant, 34 breed, 7 probably breed and 13 are summer and winter resident. Clarke (1977) recorded nine new vagrant species at Azraq, including one new to Jordan, the Black Wheatear, Oenanthe leucura. Two migrations of birds pass through Azraq. Spring migration, from April - May, the birds come from the continent of Africa. They move north, stopping for hours, days or weeks, at Azraq. The most important species are warbler, swallow, fly-catcher, chat, bee-eater, roller, wagtail, wader, ibis, stork, crane, heron, falcon, eagle, hawk and many others.

The ducks (wildfowl) in Azraq are almost migratory. They come to Azraq approximately between mid-November and mid-March (Fall migration from Europe to Africa). It has ^{been} noticed that the ducks appear in considerable numbers by the end of November. Quite a few stay in the Azraq Oasis until the end of March and the beginning of April. The most important species of the wildfowl (ducks) are mallard, teal, wigeon, pintail, shoveller, golden-eye, gargany and coots.

Threatened and lost species of the birds:

1. Houbara bustard. It is present in Azraq in small numbers. Hemsley (1966) recorded the occurrence of one sighted in the northeast of Qa el Azraq between wadi Aseikhim and wadi Rajil. Nelson (1973) reported sightings made by others in the east of Qa el Azraq and near Qasr Amra. Clarke (1977) observed 26 individual sightings in all and these were recorded either singly or in groups of two, three or five. Sixteen were in Shaumari, five to the northwest of Shaumari and three to the east of wadi Qattafi.

2. Sand plover, Charadrius mongolus. Hemsley (1966) considered the occurrence of fewer sand plovers as due to the increase in the number of visitors to the Azraq area. Nelson (1973) counters this and regards the sand plover as a migrant.

3. Ostrich, Struthio camelus. The race which was in Syria and the Jordanian Desert was Syriacus and is now certainly extinct as a result of man's interference. It has not been extinct for very long because the last specimen to be found died after being washed down in wadi Hasa in 1966 (IUCN red data book) and this up-to-date information has been accepted by IUCN.

1-7.2.3 Fishes

There are five species of fish known to occur in Azraq waters (Shishan and Druze pools) including Aphanius dispar, Tilapia zillii, Tilapia aurea, Clarias lazera and Barbus canis, Nelson (1973).

1-7.2.4 Amphibians

The marsh frog, Rana ridibunda, occurs at Shishan marsh in a variety of four colours. Clarke (1977) states that one unknown toad occurs at Azraq.

1-7.2.5 Reptiles

Twenty-one reptiles have been recorded in Azraq. Sixteen are lizards and five are snakes. Lizards, and to a lesser extent snakes, are common in different locations in Azraq. The following list shows the species and their distribution at Azraq.

| Species | Latin name | Habitat |
|---------------------------|---------------------------------|---------------------------------|
| 1. Pale agamid | Agama pallida | Limestone hammada |
| 2. Common lizard | Eremias brevirostris | Limestone hammada |
| 3. Sinai agamid | Agama sinaita | Basalt |
| 4. Starred agamid | Agama stellio | Limestone hammada |
| 5. Olive or yellow lizard | Chalcides ocellatus | Common among stones |
| 6. Desert lizard | Acanthodactylus boskianus aspes | Silty wadis |
| 7. Desert lizard | Acanthodactylus pardalis | Silty wadis |
| 8. Desert lizard | Acanthodactylus grandis | Silty wadis |
| 9. Desert lizard | Acanthodactylus persica | Silty wadis |
| 10. Desert lizard | Acanthodactylus pallida | Silty wadis |
| 11. Desert lizard | Acanthodactylus scutellatus | Silty wadis |
| 12. Gold skink | Eumeces schneideri princeps | Basalt |
| 13. Fan-footed gecko | Pterydactylus hasselquisti | Basalt |
| 14. Turkish gecko | Hemidactylus turcicus | Between Shishan and Druze |
| 15. Desert monitor | Varanus griseus | Common but not in flinty desert |
| 16. Gecko | Stenodactylus grandiceps | Limestone hammada |

Snakes: There are five species of snake.

| Species | Latin name | Characteristics |
|-------------------------------------|--------------------------|------------------|
| 1. Dice snake | Natrix t. tessellata | Harmless |
| 2. Moiler snake | Malpolon moilensis | Mildly poisonous |
| 3. Immature Montipeller snake | Malpolon monspessulanus | Mildly poisonous |
| 4. Black water-snake | Tropidonotus tessellatus | Poisonous |
| 5. Variable sand-snake | Psammophis sckokari | Poisonous |

Summary of Conservation Interest

The most interesting species at Azraq are the Gazelle, Houbara bustard and the migratory birds. Immediate attention should be given to conserving these species, because they face the likelihood of extinction due to shooting and hunting with sub-machine guns from vehicles, especially during the last twenty years. Migratory birds are of great interest to a wide variety of visitors including the general public as well as specialists, birdwatchers and ornithologists.

Conclusion

There is a great diversity of natural resources in the Azraq area, such as mineral resources (desert, limestone, basalt and salt), water resources, flora and fauna. These form a setting of

great natural beauty which makes Azraq especially suited for scientific investigation. Therefore Azraq area, which includes about 1,814 square miles of Azraq Desert National Park, is a potentially suitable area for the establishment of a National Park.

PART 2

P R E S E N T L A N D U S E

PART 2 : P R E S E N T L A N D U S E

2-1 OWNERSHIP

According to information obtained from the Director of the Department of Lands and Survey at Azraq Druze, all lands lying within the Azraq Desert National Park are government-owned, and are therefore available for settlement development or whatever use the government shall direct. The government has granted the priority rights for settlement and use of certain lands (see Figure 11) for agriculture to the permanent residents of Shishan and Druze. The government has also granted them licences for salt extraction in the Qa el Azraq area to avoid conflict of interests between salt producers and those who become engaged in agricultural development.

The villages of Azraq Druze and Azraq Shishan have grown and there are many new buildings. It has therefore become necessary to rename those villages Northern Azraq (Azraq Druze) and Southern Azraq (Azraq Shishan).

Many people from outside the area have bought plots of land in the villages and have established homes, shops and simple restaurants upon them. According to the Azraq Survey teams, the total area of Agriculture, Range and Forest lands in the Azraq

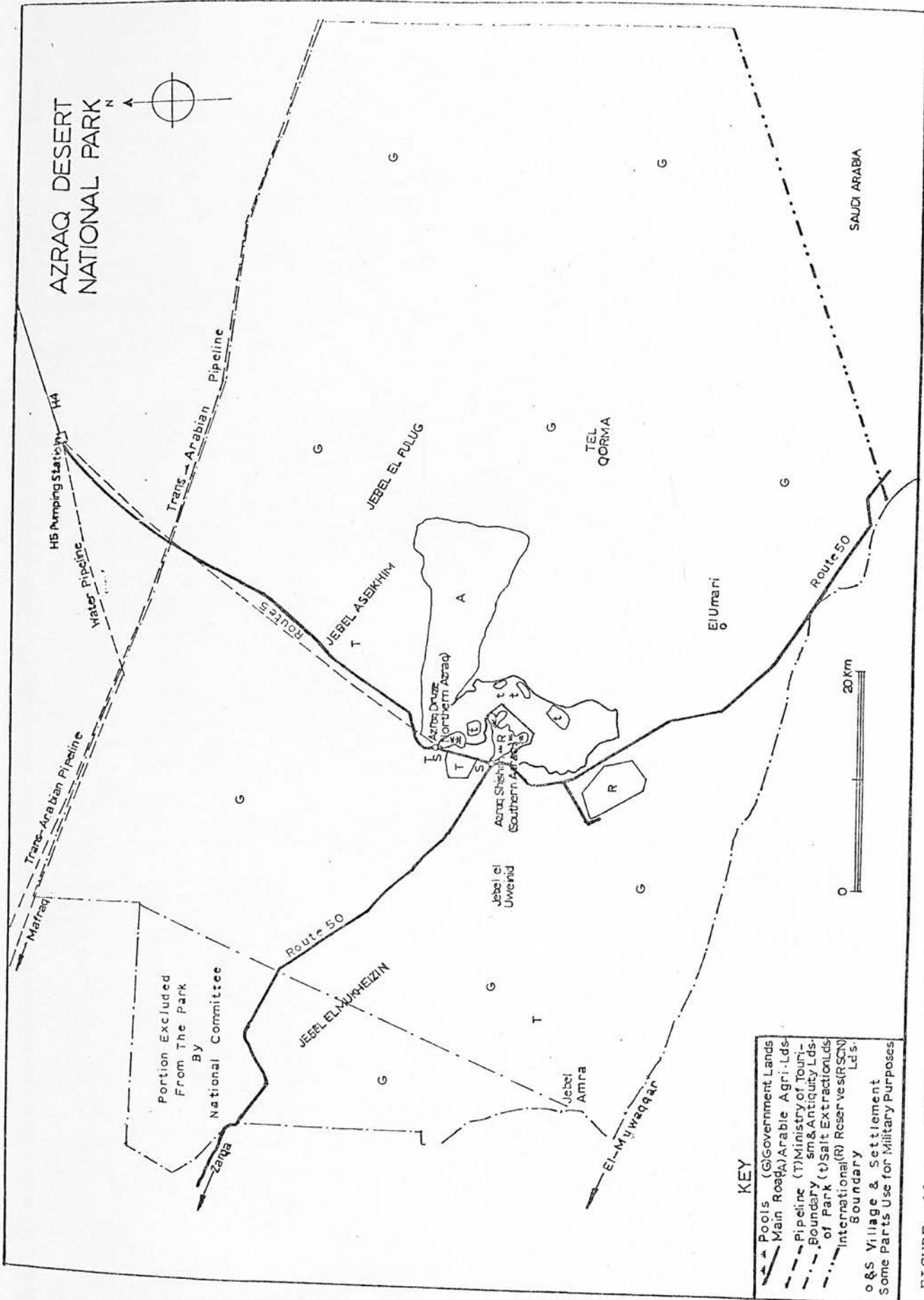


FIGURE 11 : Areas on which the government has granted rights for particular land uses.

Desert National Park is 1,000,000 donums (100,000 ha.) including 22,000 donums (2,200 ha.) for the Shaumari Wildlife Reserve which is maintained under the auspices of the Royal Society for Conservation of Nature (RSCN). Arrangements have been made by RSCN with the Lands Department to delineate and set aside 14,000 donums (1,400 ha.) of wetland (Shishan marsh) at Azraq Shishan (see Figure 11). 1,000 donums (100 ha.) have been allocated in different parts of Qa el Azraq for salt extraction. 6,000 donums (600 ha.) between Shishan and Druze villages are earmarked for recreation purposes. In addition, 530 donums (53 ha.) surrounding the historical palaces within the Park were set aside under the auspices of the Ministry of Tourism and Antiquities; an area of 13,125 donums (Ca.1312 ha.) of arable land privately owned in both Azraq Shishan and Druze has been planted under irrigation; 18,000 donums (1,800 ha.) have been allocated for the interest of the nation for defence purposes.

2-2 ARABLE AGRICULTURE

A significant area of arable land, adjoining Azraq Druze (Northern Azraq) to the east and south, has been developed for irrigated agriculture and market gardens, (see Figure 11). A survey of arable agriculture and livestock farming was carried out in the Azraq at the same time in June 1977 by interviewing each farmer on his farm to obtain full information on arable agriculture and livestock population. The results of land use for arable agriculture are shown in Table 4.

TABLE 4 : Results of land use for arable agriculture

| Azraq | Farms number | Total Area/ donums | Planted Area/ donums | Unplanted Area/ donums | Olive trees | Grapes | Almonds | Apricots | Apples | Dates Palm | Pomegranates | Vegetable Area/ donums |
|---------|-----------------|--------------------------|----------------------------|------------------------------|----------------|--------|---------|----------|--------|---------------|--------------|------------------------------|
| Shishan | 7 | 310 | 270 | 40 | 2,120 | 1,020 | 165 | 70 | 75 | 20 | 100 | 20 |
| Druze | 47 | 12,815 | 4,522 | 8,293 | 22,250 | 20,770 | 1,245 | 230 | 520 | 850 | 2,090 | 700 |
| | 54 | 13,125 | 4,792 | 8,333 | 24,370 | 21,790 | 1,410 | 300 | 595 | 870 | 2,190 | 720 |

At the present time 4,792 donums (ca.479 ha.) are under irrigation and each farm has its own bore-hole(s). 8,333 donums (ca.833 ha.) are unplanted areas and this area may be brought under agriculture in the future. According to the annual report of the Department of Statistics (1975) the total area which has been planted in Azraq Druze is about 4,600 donums (460 ha.), and in Azraq Shishan it is about 223 donums (ca.22 ha.). Therefore the bulk of the land which is under irrigation is in Azraq Druze. The gardens in both villages are bounded by hedges of Tamarix mayeri and wind-breaks of Eucalyptus spp., Casuarina cunninghamiana and Salix aecomophytus and fruit trees of apricots, pomegranates, date palms, peach, olives and grapes. Other vegetable crops include cucumber, pumpkin, melon, lettuce, maize, tomato, okra, green beans, potato, cauliflower, and a small amount of fodder crops such as alfalfa. Sunflower is also present.

2-3 LIVESTOCK FARMING

It is very difficult to assess the number of livestock in Azraq villages because many animals are hidden in central marsh, e.g. water buffalo. The following information was obtained from the annual report of the Department of Statistics, 1975, (see Table 5). Also, according to the earlier mentioned livestock farming survey, which was carried out in June 1977, the following results emerge, (see Table 6).

TABLE 5 : Information obtained from the Annual Report of the Department of Statistics, 1975, relating to the number of livestock in Azraq villages

| Village | Cows | Water Buffaloes | Sheep | Goats | Camels | Horses | Donkeys | Rabbits | Poultry | |
|---------------|------|-----------------|-------|-------|--------|--------|---------|---------|---------|------|
| | | | | | | | | | Meat | Eggs |
| Azraq Druze | 199 | - | 102 | 117 | - | 4 | 1 | - | - | - |
| Azraq Shishan | 68 | 70 | 133 | 234 | 40 | 14 | 4 | - | - | - |

TABLE 6 : Results emerging from the Livestock Farming Survey (June 1977)

| Village | Cows | Water Buffaloes | Sheep | Goats | Camels | Horses | Donkeys | Rabbits | Poultry | |
|---------------|------|-----------------|-------|-------|--------|--------|---------|---------|---------|-------|
| | | | | | | | | | Meat | Eggs |
| Azraq Druze | 227 | - | 180 | 169 | - | 9 | 12 | 72 | 12,000 | 1,000 |
| Azraq Shishan | 128 | 145 | 205 | 290 | 550 | 28 | 33 | 50 | - | - |

From Tables 5 and 6 it can be seen that the number of livestock increased rapidly in the two years period and this would cause heavy grazing and browsing in the Azraq area.

There are 19 cattle farms, including two poultry farms, in Azraq Druze, and nine cattle farms in Azraq Shishan, in addition to 145 water buffaloes owned by individuals in Azraq Shishan. Inhabitants in both villages (Druze and Shishan) keep and raise livestock. Cattle, donkeys and horses are to be seen grazing and browsing at Druze marshes in addition to the camels which are used for transporting salt. A few goats occur about the houses in Azraq Druze. In Shishan marshes cattle, donkeys, horses and water buffaloes graze freely. Livestock in Azraq is affecting the marsh vegetation both in Druze and Shishan marshes, because of the heavy grazing and browsing, especially in the Nitraria-Tamarix zone. This is in addition to severe grazing occurring on the Typha-arundo community. Figure 12 illustrates the distribution of livestock in Azraq Druze and Azraq Shishan.

2-4 NOMADIC PASTORALISM

Three main Bedouin tribes (Beni-Sakhr, Rwala and Sirhan) are involved in the nomadic use of the Park during their movements within and outwith the Park (see Figure 2). Beni-Sakhr is the largest tribe. This tribe have their summer encampments in the southeast of Amman and their winter grazing is in wadi Sirhan (Saudi Arabia). Their territory includes lands along the south-eastern part of Jordan. This tribe, considered the most important

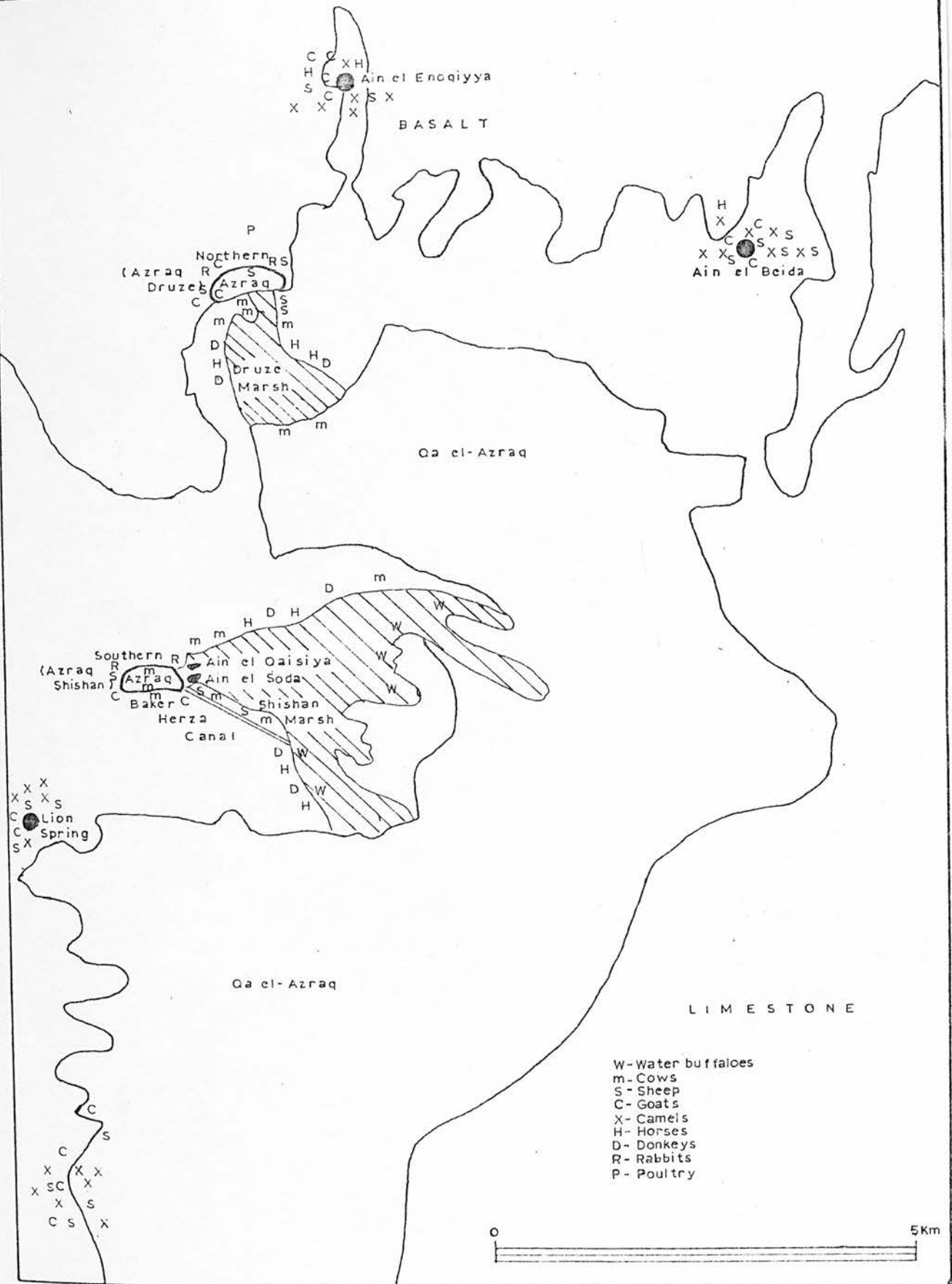


FIGURE 12 : Distribution of livestock in Azraq Druze and Azraq Shishan (after Nelson, 1973).

camel breeders, owned 12,000 - 15,000 camels, some 500 horses and some 500,000 sheep and goats (Harris, 1958). The Rwala tribe is the second largest tribe after Beni-Sakhr. Their summer encampments are in southwestern Syria, while their wintering area is in Saudi Arabia. The tribe moves into the Park from the northwest to the southeast in an arc to Iraq and then continues to Saudi Arabia. There is no information about the number of their herds but they are basically camel herdsman. The Sirhan tribe is small and moves between its summer encampment in the Mafraq area and its wintering area near Ain el Beida (see Figure 2). There seems to be no information about the number of their stock.

Nomadic pastoralism is dependent on the availability of pasturage and water in widely separated places at different times. Grazing and browsing by the cattle, camels, sheep, goats and donkeys of the nomadic Bedouin has an ancient origin and is still an important form of land use, despite the harshness of nomadic life. Nowadays the stock is watered at wells, springs or desert watering points, which are focal points for Bedouin encampments during their movements through the Park. Most of the Bedouin encampments are close to the water resources, e.g. Ain el Beida. Thus the animals affect the nearby vegetation as a result of heavy grazing which occurs during their passage through the Park. Already the vegetation of much of the Park is in a seriously over-grazed condition due to heavy grazing over many centuries. Some Bedouin possess vehicles and carry water in drums to their stock in remote grazing areas. This development in range-grazing could result in further rapid depletion of the vegetation as it leads to over-grazing.

2-5 WATER USE

There are three main categories of water use in the Azraq Desert National Park:

2-5.1 Pumping Water for Municipal Consumption

The amount of water pumped to several cities and towns, e.g. Irbid in the Northern District of Jordan, from the north pool in Druze village and Qaisiya pool in Shishan, was calculated from the inventory done by Mudallal (1967) as 4,200 m³/day or about 1.5 MCM/year. There has been a significant increase in pumping since that time. Following the 1967 war the demand for water increased because of an increase in the population due to the settlement of many refugees in Irbid. The peak demand for water is during the summer. Now the pumping is about 7,200 m³/day or about 2.6 MCM/year (figures obtained from the Engineer at Azraq Druze pumping station in June, 1977). Water pumping started in 1963 at a rate of 150 m³/hr (3,600 m³/day).

2-5.2 Water for Irrigation

Water for irrigation is pumped from the shallow wells in the area east and southeast of Azraq Druze. Local water consumption at Azraq, including the local pumping from the wells for irrigation, was calculated by Madallal (1967) to be about 1,350 m³/day or 0.5 MCM/year, but the present rate of abstraction is greater owing to the digging of further wells for irrigation purposes. The total amount of surface water available in the Azraq area is

about 2,100 m³/hr distributed as follows: 1,232 m³/hr from Shishan pools (605 m³/hr from Ain el Qaisiya plus 627 m³/hr from Ain el Soda) and 388 m³/hr from Druze pools. Baker and Harza canal has a discharge of 197 m³/hr. This discharge, plus 15%, are considered as seepages that can not be measured. The water quality of the Druze pools is better than the Shishan pools. Mudallal added that if the pumping increased to 700 m³/hr there should be no effect on the aquifer balance, but it has been noticed that the level of water in all the pools of Azraq has gone down. Furthermore, the tall grasses in the marshes, Arundo donax and Scirpus litoralis, were 2 m. in height but are now generally shorter. It therefore appears that pumping does affect the water balance. In addition it would appear likely that a problem of water pollution will arise at some time in the future because there is no underground sewage system in either of the two Azraq villages and they are very close to the pools.

2-5.3 Other Local Consumption

The local consumption of water in both villages is distributed as follows:

1. Water for drinking and domestic use is distributed to both villages by tankers because there is no pipe-borne water system.
2. Water for domestic livestock for the whole of Azraq.
3. Water for Bedouin stocks taken by drums conveyed by vehicles.

4. Water for constructions such as building roads and other establishments.
5. Water for fish farming.

2-6 SALT EXTRACTION

Economically salt extraction is the most important local industry and land use in the Azraq Desert National Park. Villagers of both Shishan and Druze are engaged in this industry. The settlement of Azraq Druze was founded for salt extraction. In 1969, out of 202 families, 120 were partly or wholly engaged in salt extraction, Nelson (1973). At present there are about 336 licence holders from both villages. In 1975 the salt extractors formed a co-operative body which was largely responsible for controlling the salt industry and raising production to 200,000 sacks of 140 kg. per annum .

Salt mining is restricted in Qa el Azraq to four sites. The biggest is called Deghyleh and it is located at the south-eastern corner of the Qa; the second is at Ramtha at the north-western edge; the other two are very small areas along the eastern side of the Qa (see Figure 13). Salt extraction occurs between May and late July, and the villagers migrate to the salt works on the Qa. Rainfall is an important factor, because the rains compact the soil and form a hard crust on the bottom of the pans which prevents the soil mixing with the salt. The rains also compact the soil and prevent pollution of the salt with wind-borne dust.

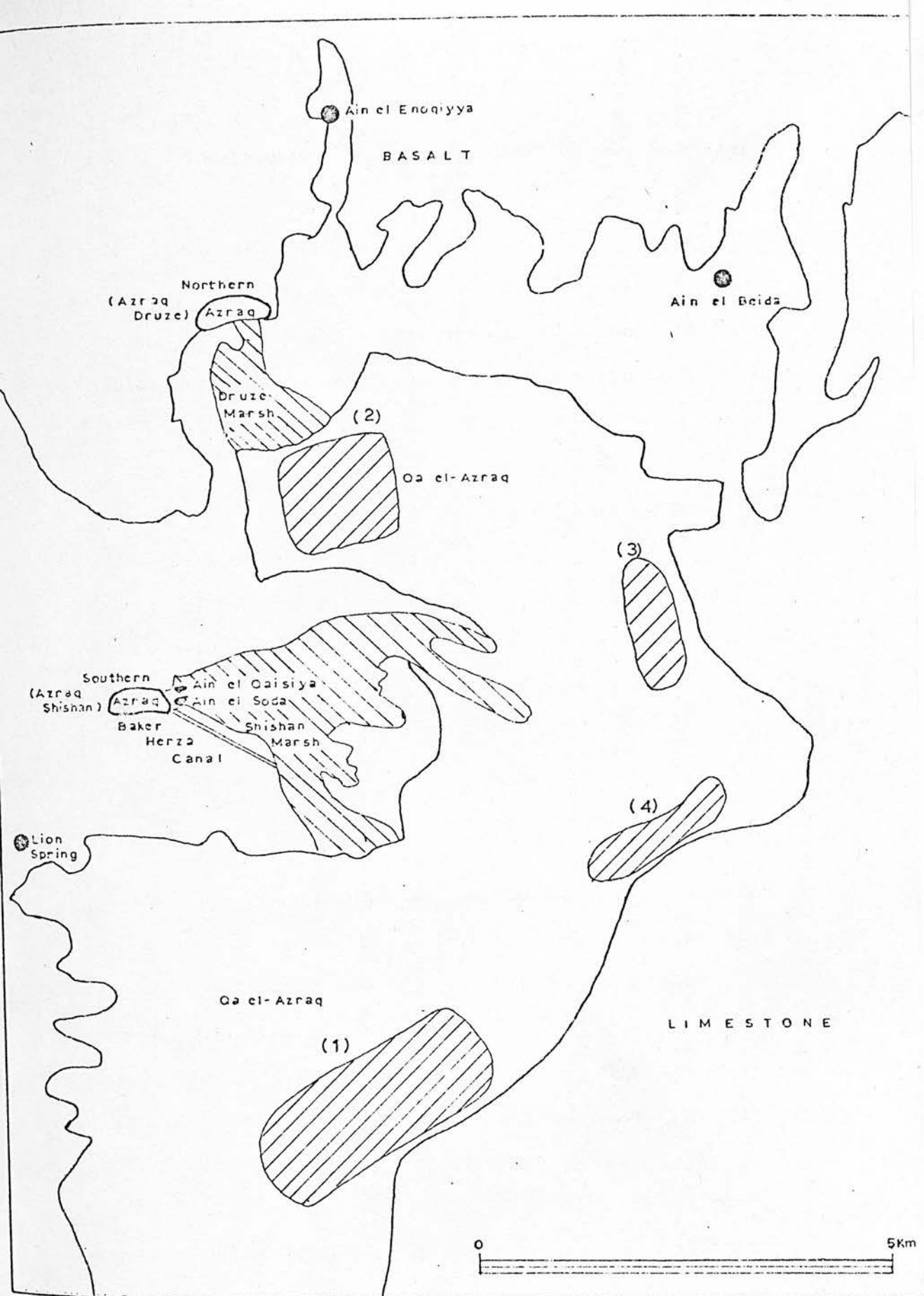


FIGURE 13 : Distribution of salt extraction zones in Qa el Azraq, (after Nelson, 1973)

There are two conditions for salt extraction in Azraq:

1. The rights of salt extraction are only granted to the inhabitants of Druze and Shishan or to a person who has a formal document to prove that he worked on salt extraction before the establishment of the Azraq Co-operative Society (ACS).

2. Each member of ACS is entitled to extract 70 sacks of salt of 140 kg. for himself and 70 sacks for each member of his family. In addition, the head of each family is entitled to 120 sacks of the same weight. In this way the rate of salt extraction is controlled. There is no indication as to whether the present level of extraction can be sustained indefinitely.

2-7 MILITARY USE

The strategic importance of the Azraq area has been recognised since ancient times. The Roman Empire established many forts in the Jordanian Desert within what is now the Azraq Desert National Park, e.g. Qasr (Palace) el Azraq, Qasr Aseikhim, Qasr Amra and Qasr Kkarana (shown in Figure 16 - historic palaces). The main object of these forts was to provide a chain of garrisons guarding the eastern borders of the Roman Empire. At the present time the use of part of the Azraq area for military purposes is inevitable because of its strategic location between Syria, Iraq, Saudi Arabia and Palestine, and its importance as a commercial link between the neighbouring Arab countries.

Because of the geographical location of Azraq there is a demand for land in the Azraq Desert National Park for international communications as well as internal access. The following main highways are shown in Figure 14:

1. Amman-Zarqa-Azraq highway (route 50): This highway leads to the northwestern entrance to the Park. Its length is about 100 km.

2. Saudi Arabia border - New el Umari - Azraq (route 50): This highway leads to the south entrance of the Park and is about 50 km. long.

3. Mafraq - H.5 - Azraq highway (route 5): leads to the north entrance to the Park. The road between H.5 and Azraq is under construction and runs beside the water pipeline. The length of this road between H.5 and Azraq Druze is about 47 km.

A highway from Maan - Al Jafr - Bayir - Azraq, to connect Aqaba Gulf with the Arabian Gulf via Azraq, has been proposed as a result of these road developments.

Azraq has become a major crossroad in the Middle East. Considerable volumes of heavy transport pass through it going to and from Saudi Arabia, Kuwait, Iraq and even Western Europe. In

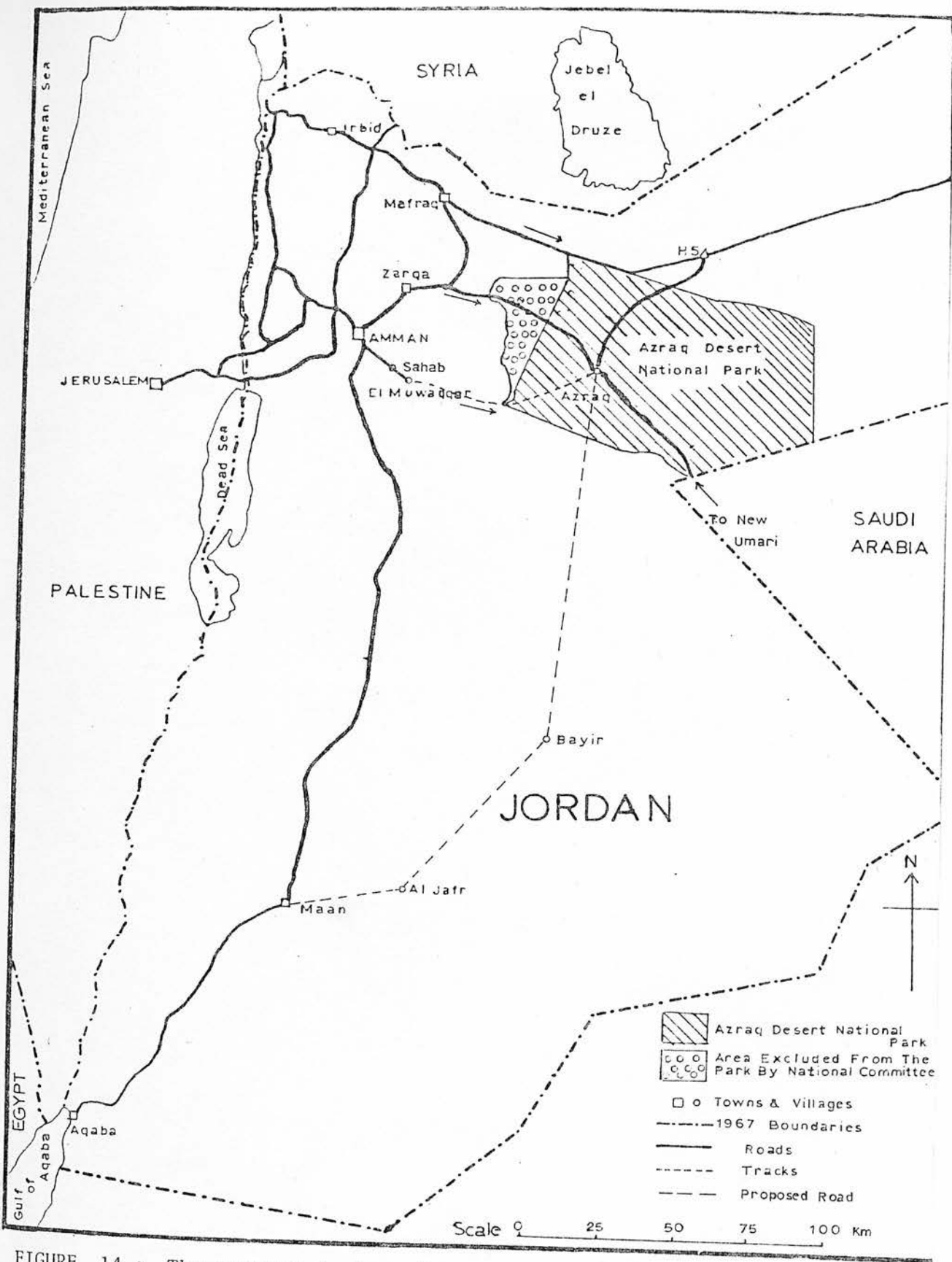


FIGURE 14 : The approach to Azraq Desert National Park by highways from different directions, (after Hemsley, 1966).

addition there are a number of roads and tracks which serve the immediate vicinity of Azraq and the outlying parts of the Park.

2-9 RECREATION AND CONSERVATION USE

A survey was carried out to assess the recreational and conservation use of the Azraq area. Three different questionnaires were prepared for three categories of people:

- 2-9.1 Azraq Desert National Park Visitors Questionnaire.
- 2-9.2 Public Questionnaire.
- 2-9.3 Special Questionnaire for Naturalists, members of the Royal Society for Conservation of Nature (RSCN), the University of Jordan, and the Ministry of Agriculture.

Each of these categories of people were interviewed and requested to fill in the appropriate questionnaire.

2-9.1 The Visitor Census was carried out in the Azraq area at the main crossroad of Azraq Shishan and Azraq Druze, the Shaumari Wildlife Reserve, and in the more remote areas, during the period May-July 1977. Due to the low number of people visiting Azraq Park this questionnaire was carried at peak hours (10 a.m. - 4 p.m.); most on Fridays. Each visitor was asked to fill in a "User Census Form" (see pattern on the following page, including example of the actual forms in English and Arabic).

Azraq Desert National Park User Census

This survey is a part of a study of Azraq to assess and reconcile the different uses eg. recreation, scientific use, agriculture and other uses such as military and communication.

I should be grateful if individual visitors or leaders of groups or sportmen would answer the questions by ticking or filling in the appropriate box or space.

Date: / / 1977

1. Occupation : ☐
2. Sex : Female ☐ Male ☐
3. Where do you live? town or village
4. Why do you come to Azraq? or live in this area?
5. How long will you be in Azraq area?days hours
6. How many times have you visited Azraq previously in the last year?
 0 ☐ 1-3 ☐ 4-6 ☐ more than ☐
 times times 6 times ☐

7. Which of the following would like to see added to the amenities of Azraq?

| | | | | | | | | | |
|---------------|--------------------------|---------------|--------------------------|------------|--------------------------|----------------------|--------------------------|------------------------|--------------------------|
| Restaurant | <input type="checkbox"/> | Hotel | <input type="checkbox"/> | Bus lines | <input type="checkbox"/> | Petrol station | <input type="checkbox"/> | Swimming pool | <input type="checkbox"/> |
| Sport fishing | <input type="checkbox"/> | Rest house | <input type="checkbox"/> | Cafe | <input type="checkbox"/> | Car park | <input type="checkbox"/> | Hides for nature study | <input type="checkbox"/> |
| Camping area | <input type="checkbox"/> | Sport hunting | <input type="checkbox"/> | Chalets | <input type="checkbox"/> | Clay pigeon shooting | <input type="checkbox"/> | | |
| More clinics | <input type="checkbox"/> | More schools | <input type="checkbox"/> | lavatories | <input type="checkbox"/> | Shopping Center | <input type="checkbox"/> | Piped water | <input type="checkbox"/> |

8. Which of the following would you not like to see added to amenities of Azraq?

| | | | | | | | | | |
|---------------|--------------------------|-----------------|--------------------------|----------------------|--------------------------|----------------|--------------------------|------------------------|--------------------------|
| Restaurant | <input type="checkbox"/> | Hotel | <input type="checkbox"/> | Bus lines | <input type="checkbox"/> | Petrol station | <input type="checkbox"/> | Swimming pool | <input type="checkbox"/> |
| Sport fishing | <input type="checkbox"/> | Rest house | <input type="checkbox"/> | Cafe | <input type="checkbox"/> | Car park | <input type="checkbox"/> | Hides for nature study | <input type="checkbox"/> |
| Sport hunting | <input type="checkbox"/> | Chalets | <input type="checkbox"/> | Clay pigeon shooting | <input type="checkbox"/> | more clinics | <input type="checkbox"/> | More school | <input type="checkbox"/> |
| lavatories | <input type="checkbox"/> | Shopping centre | <input type="checkbox"/> | Piped water | <input type="checkbox"/> | | | | |

9. Which aspect of Azraq do you particularly enjoy?
10. Why do you cultivate here? (special for farmers).....
11. Why do you graze here? (special for shepherds).....
12. Do you have any suggestions concerning the recreational use of Azraq Desert National Park?

استفتاء زائري متنزه الازرق القومي

تهدف هذه الدراسة الى تقييم استغلال متنزه الازرق من النواحي الترويحية والعلمية والزراعية وغير ذلك.

لذا ارجو من الزائر الكريم سواء كان سائحا او صيادا او قائدا لمجموعة سياحية التلطف بتعبئة هذه الاستمارة متوخيا الامانة والصدق حيث ان نتائج هذه الدراسة ستستعمل في تحضير رسالة الماجستير لحد الطلاب الاردنيين في جامعة ادنبره. يرجى وضع علامة (x) داخل المربع المناسب للاجابة او تعبئة الفراغ المقابل للسؤال.

- ١- الوظيفة :
- ٢- الجنس : انثى ☐ ذكر ☐
- ٣- مكان الإقامة : المدينة والقرية المحافظة
.....
- ٤- اسباب الزيارة :
.....
- ٥- مدة الزيارة للازرق يوم ساعة
- ٦- بالنسبة للمقيمين بالازرق بشكل دائم ما هي اسباب اختيارك للازرق للاقامة؟
.....
- ٧- عدد المرات التي زرت بها الازرق في العام الماضي :
ولا مرة ☐ ١-٣ مرات ☐ ٤-٦ مرات ☐ اكثر من ٦ مرات ☐
- ٨- ما هي برأيك الخدمات السياحية المناسبة توفرها في الازرق لتجعل منه منتجعا سياحيا متطورا ؟
مطعم ☐ فندق ☐ مقهى ☐ شاليهات ☐ حوانيت ☐
محطة بنزين ☐ بركة سباحه ☐ استراحه سياحية ☐
مرافق صحية ☐ خدمات نقل دائمه ☐ مكان خاص للتخييم ☐
مكان لوقوف السيارات ☐ زيادة عدد المدارس ☐ مزاوله هواية الصيد ☐
مد شبكة مياه الى البيوت ☐ مكان رماية لتدريب الصيادين ☐
السماح بممارسة هواية صيد السمك ☐ زيادة عدد العيادات الصحيه ☐
مخابى لمراقبة الحيوانات البرية ودراسة طبيعته ☐

٩- ماهي برأيك الخدمات السياحية الغير مناسب توفرها في الازرق لتجعل منه منتجما سياحيا متطورا ؟

- ☐ مطعم ☐ فندق ☐ مقهى ☐ حوانيت ☐ محطة بنزين ☐
- ☐ بركة سباحه ☐ استراحة سياحية ☐ شاليهات ☐ مكان خاص للتخييم ☐
- ☐ زيادة عدد المدارس ☐ مكان لوقوف السيارات ☐ مرافق صحية ☐
- ☐ مزاوله هواية الصيد ☐ مد شبكة مياه الى البيوت ☐ خدمات نقل دائمه ☐
- ☐ مكان رمية لتدريب الصيادين ☐ زيادة عدد العيادات الصحيه ☐
- ☐ مخايب * لمراقبة الحيوانات البرية ودراسة الطبيعه ☐
- ☐ السماح بممارسة هواية صيد السمك ☐

- ١١- ماذا يعجبك بالازرق كمنتجع سياحي ؟
- ١٢- لماذا تمارس الفلاحة في الازرق ؟ (سؤال خاص بالمزارع)
- ١٢- لماذا تقوم بالرعي في الازرق ؟ سؤال خاص باصحاب المواشي)
- ١٣- ماهي اقتراحاتك لتطوير المتنزه القومي في الازرق ؟

Method of Data Analysis

The data gathered during the Visitor Census were analysed by tabulation and cross-tabulation. This analysis was carried out by computer using the procedure (Sub-program Crosstabs and Sub-program Codebook) described in "Statistical Package for the Social Sciences" (SPSS), (Nie, et al., 1970). The census data were transferred through coding forms to computer cards. One advantage of using cards is that it makes checking and the correction of mistakes much easier. Also it is easy to add to the number of cards, or alter the information on the specific cards, should new facts come to light. If required the information on the cards can easily be coded on a disc for storage and use by the computer in the future.

Results of Visitors Census Analysis

The results of the Visitor Census can be seen in the following tables (the relative frequency has been calculated to the nearest 0.1%):

TABLE 7 : Occupation of Visitors

| Code | Occupation | Absolute Frequency | Relative Frequency % |
|------|-------------------------|--------------------|----------------------|
| 1 | Professional | 37 | 38.1 |
| 2 | Self-employed | 14 | 14.4 |
| 3 | Government employed | 20 | 20.6 |
| 4 | At School or University | 20 | 20.6 |
| 5 | Retired men | 6 | 6.2 |
| | | 97 | 100.0 |

Out of a sample of 97 respondents there were 38.1% professional visitors, including lecturers in the university, physicians, teachers and engineers. The last two were in the majority. 20.6% were government staff in a mission at Azraq. 20.6% were students in schools, colleges and the university. 14.4% were merchants on a one-day visit, and 6.2% were retired men who had come to Azraq on a one-day visit for recreation.

TABLE 8 : Sex of Visitors

| Code | Sex | Absolute Frequency | Relative Frequency % |
|------|--------|--------------------|----------------------|
| 1. | Female | 24 | 24.7 |
| 2. | Male | 73 | 75.3 |
| | | 97 | 100.0 |

Table 8 shows that 75% of the Park visitors were males and 25% were females. Thus the majority of Park visitors were males.

TABLE 9 : Home residence

| Code | Home Residence | Absolute Frequency | Relative Frequency % |
|------|------------------|--------------------|----------------------|
| 1 | Amman | 63 | 64.9 |
| 2 | Zarqa | 8 | 8.2 |
| 3 | Irbid and Salt | 7 | 7.2 |
| 4 | Resident (Azraq) | 9 | 9.3 |
| 5 | Foreigners | 10 | 10.3 |
| | | 97 | 100.0 |

Table 9 shows the various places from which the visitors came. It can be seen that the majority of visitors came from Amman, the capital, and other urban centres, irrespective of the distance from Azraq. There is comparatively little pressure on Azraq from nearby areas.

TABLE 10 : Purpose of Visit

| Code | Purpose of Visit | Absolute Frequency | Relative Frequency % |
|------|---------------------------|--------------------|----------------------|
| 1 | Recreation | 26 | 26.8 |
| 2 | Visit | 14 | 14.4 |
| 3 | Work | 9 | 9.3 |
| 4 | Tourism | 26 | 26.8 |
| 5 | Scientific Trip | 6 | 6.2 |
| 6 | Do not know | 3 | 3.1 |
| 7 | Archaeological | 11 | 11.3 |
| 8 | Shaumari Wildlife Reserve | 2 | 2.1 |
| | | 97 | 100.0 |

Table 10 shows that the majority of visitors came to Azraq Park for recreation and tourism (but to an ordinary man visiting means recreation), and the majority of visitors answered the relevant question by "I came to visit Azraq for recreation". For this reason I have combined the numbers of visitors who came to Azraq for recreation and for a visit and taken the figure of 41.2% to apply to informal recreation. It will be noted from Table 10 that most of the visitors came to Azraq for informal recreation, tourism and for archaeological reasons to see the historical palaces.

TABLE 11 : Duration of Visit

| Code | Duration of Visit | Absolute Frequency | Relative Frequency % |
|------|-------------------|--------------------|----------------------|
| 1 | One day visit | 94 | 96.9 |
| 2 | Half day visit | 3 | 3.1 |
| | | 97 | 100.0 |

Table 11 shows that none of the visitors to the Azraq Park stayed longer than one day. This may be due to the lack of facilities and accommodation in Azraq.

TABLE 12 : Preferences for additional facilities

| Code | Restaurant | Hotel | Bus Lines | Petrol Station | Swimming Pool | Sport Fishing | Rest House | Cafe | Car Park | Hides for Nature Studies | Camping Area | Sport Hunting | Chalets | Clay Pigeon Shooting | More Clinics | More Schools | Lavatories | Shopping Centre | Piped Water |
|------|------------|-------|-----------|----------------|---------------|---------------|------------|------|----------|--------------------------|--------------|---------------|---------|----------------------|--------------|--------------|------------|-----------------|-------------|
| 0 | 9.3 | 11.3 | 19.6 | 32.0 | 15.5 | 44.3 | 14.4 | 23.7 | 33.0 | 23.7 | 25.8 | 17.5 | 25.8 | 22.7 | 40.2 | 44.3 | 18.6 | 35.1 | 38.1 |
| 1 | 89.7 | 86.6 | 80.4 | 66.0 | 83.5 | 49.5 | 85.6 | 63.9 | 61.0 | 71.1 | 60.0 | 51.5 | 72.2 | 43.3 | 57.7 | 50.5 | 80.4 | 55.7 | 57.7 |
| 2 | 1.0 | 2.1 | - | 2.1 | 1.0 | 6.2 | - | 12.4 | 5.2 | 5.2 | 8.2 | 30.9 | 2.1 | 34.0 | 2.1 | 5.2 | 1.0 | 9.3 | 4.1 |

KEY : 0 = Neutral (no answer)
 1 = Would like
 2 = Would not like

TABLE 12a: Most Popular Innovations

| No. | Facilities | In Favour % | Against % |
|-----|---------------|----------------|--------------|
| 1 | Restaurant | 89.7 | 1.0 |
| 2 | Hotel | 86.6 | 2.1 |
| 3 | Rest House | 85.6 | 0.0 |
| 4 | Swimming Pool | 83.5 | 1.0 |
| 5 | Bus Lines | 80.4 | 0.0 |
| 6 | Lavatories | 80.4 | 1.0 |

TABLE 12b: Most Unpopular Innovations

| No. | Facilities | Against % | In Favour % |
|-----|----------------------|--------------|----------------|
| 1 | Clay Pigeon Shooting | 34.0 | 43.3 |
| 2 | Sport Hunting | 30.9 | 51.5 |
| 3 | Cafe | 12.4 | 63.9 |
| 4 | Shopping Centre | 9.3 | 55.7 |

The above information is derived from Table 12 and indicates that the present visitors would like to see a general increase in the range of facilities available. The sizeable opposition to clay pigeon shooting and sport hunting combined with the slightly larger number in favour of these sports suggests that active management is required to avoid conflict.

TABLE 13 : Visitors' Major Points of Interest

| Code | Major Interest | Absolute Frequency | Relative Frequency % |
|------|---------------------------|--------------------|----------------------|
| 0 | No answer | 16 | 16.5 |
| 1 | The pools | 23 | 23.7 |
| 2 | The oasis in the desert | 10 | 10.3 |
| 3 | The Azraq nature | 13 | 13.4 |
| 4 | Migratory birds | 2 | 2.1 |
| 5 | The ecology of Azraq | 2 | 2.1 |
| 6 | Mineral water | 5 | 5.2 |
| 7 | Shanmari Wildlife Reserve | 4 | 4.1 |
| 8 | The Azraq climate | 6 | 6.2 |
| 9 | Arable land | 1 | 1.0 |
| 10 | Archaeological Palaces | 4 | 4.1 |
| 11 | Peace and quiet | 8 | 8.2 |
| 12 | Geographic location | 1 | 1.0 |
| 13 | Hunting ducks | 1 | 1.0 |
| 14 | Fish farms | 1 | 1.0 |
| | | 97 | 100.0 |

Table 13 illustrates the points of major interest to the visitors. Out of a sample of 97 respondents, 23.7% of the visitors were interested in the Azraq pools while 16.5% of the sample did not answer this question. 13.4% of the visitors came to enjoy the beautiful nature of Azraq while 10.3% came to enjoy the presence of the oasis in the middle of the Azraq Desert.

TABLE 14 : Visitors' Suggestions

| Code | Suggestions | Absolute Frequency | Relative Frequency % |
|------|--|--------------------|----------------------|
| 0 | None | 20 | 20.6 |
| 1 | Tourist facilities (hotels, restaurants and Rest houses) | 25 | 25.8 |
| 2 | Not to disturb wild animals | 1 | 1.0 |
| 3 | Educate the public on the importance of nature resources | 1 | 1.0 |
| 4 | Employ qualified staff and good administration | 1 | 1.0 |
| 5 | Keep nature resources from damage | 3 | 3.1 |
| 6 | Developing the hot mineral water for recovery purposes | 1 | 1.0 |
| 7 | Instal water and electricity in Azraq | 2 | 2.1 |
| 8 | Establish a playground for children | 2 | 2.1 |
| 9 | Build hospital and clinic at Azraq | 2 | 2.1 |
| 10 | Grow fruit and forest trees | 8 | 8.2 |
| 11 | Provide accurate map and tourism guide | 2 | 2.1 |
| 12 | Construct more roads to attain the historical sites | 2 | 2.1 |
| 13 | Supply the Park with all facilities (in question 7) | 10 | 10.3 |
| 14 | Encourage research and studies | 1 | 1.0 |
| 15 | Bring the wild animals to Shaumari Wildlife Reserve | 2 | 2.1 |
| 16 | Establish fish farms | 1 | 1.0 |
| 17 | Establish a factory for the salt industry | 1 | 1.0 |
| 18 | Protect the natural resources to make them productive | 1 | 1.0 |
| 19 | Azraq should not be a National Park in this situation | 2 | 2.1 |
| 20 | Organise tourist trips | 2 | 2.1 |
| 21 | Put a complete ban on hunting | 7 | 7.2 |
| | | 97 | 100.0 |

Table 14 illustrates the suggestions of the visitors to the Park. These seem to indicate that 25.8% suggest supplying Azraq

Park with tourist facilities (hotels, restaurants and rest houses), 20.6% did not suggest anything, 10.3% suggested the supply of Azraq Park with all facilities which have been mentioned in question 7 (Original Questionnaire), 8.2% suggested the growing of fruit and forest trees and 7.2% suggested a complete ban on hunting in Azraq.

Conclusions

The following is a summary of the findings of the Azraq Desert National Park Visitor Census.

- (a) Most of the visitors were employed in one of the professions (including lecturers in the University, engineers, physicians and teachers) but most of them were engineers and teachers.
- (b) The majority of visitors came from Amman, the capital.
- (c) The majority of visitors came to Azraq for recreation and tourism.
- (d) Most of the visitors would like to see a general increase in tourist facilities (restaurants, rest houses and hotels) within the Park. There is also a sizeable opposition to clay pigeon shooting and sport hunting by the visitors.
- (e) Visitors' major interest in Azraq are the presence of pools and the natural beauty of Azraq.
- (f) Most visitors suggested providing Azraq with tourist facilities.

2-9.2 The Second Survey (Public Questionnaire)

The Public Questionnaire was conducted in Amman, the capital, because it is the nearest and largest concentration of potential users. To obtain the views of the people in the streets and shops of Amman, each respondent was asked to fill in a "Public Questionnaire Form" (see pattern on the following pages including example of the original forms in English and Arabic).

Method of Data Analysis:

The data gathered through the Public Questionnaire were analysed by tabulation and cross-tabulation. This analysis was carried out by computer using the procedure earlier referred to, "Statistical Package for the Social Sciences", SPSS, (Nie, et al., 1970). The census data were transferred through coding forms to computer cards.

Results of the Public Response to Questionnaire:

The results of the "Public Questionnaire" can be shown in the following Tables. The analysis is based on 100 respondents.

AZRAQ DESERT NATIONAL PARK

PUBLIC QUESTIONNAIRE

This survey is considered as a part of Azraq Desert National Park studies. It is being conducted by an Arab student at Edinburgh University, Scotland. The survey is to evaluate the recreational value in this area. (I should be grateful if anybody would answer the questions by ticking or filling the appropriate box or space after reading the following description of Azraq).

Brief Description of Azraq:

Azraq Oasis is about 100 km. east of the capital - Amman. It is linked by a highway road which passes through many deserted palaces of tourist and antique importance. Azraq Oasis is characterised by its potable water which seeps from underground and accumulates in pools. The depth of these pools ranges between 0.65 to 2.4 m. The pools contain different kinds of fish and the banks are covered with different kinds of grasses.

Azraq is not only important as a tourist attraction but also as a crossroad for birds migrating from Europe to Africa in Autumn and from Africa to Europe in spring time. These migrating birds attract thousands of bird watchers and hunters to this area. A few years ago hot mineral water was discovered at Azraq. Owing to this discovery the Ministry of Tourism and Antiquity has established a large hotel, restaurant and other recreational facilities.

1. Have you heard about Azraq before you read the above brief description of Azraq? Yes ☐ No ☐
2. Have you visited Azraq? Yes ☐ No ☐
3. If you visited Azraq which aspect do you particularly enjoy?
4. What is the main purpose of your visiting Azraq?
5. Do you have any notices or suggestions concerning the recreational use of the Azraq Desert National Park?
.
6. Do you have a car? Yes ☐ No ☐
7. If the transport (Bus) is available at a cheap price (J.D.2 = £3.50) would you like to visit Azraq? Yes ☐ No ☐

يعتبر هذا المسح كجزء من دراسة متنزه الازرق القومي يجريها احد الطلاب العرب في جامعة ادنبره/ اسكتلندا لفرض تقييم الناحية الترويحية في هذه المنطقة .

لمحة عن الازرق :

تقع واحة الازرق على بعد ١٠٠ كيلومترا شرق العاصمة عمان ويربطها بها طريق معبد تمر بالعديد من القصور الصحراوية ذات الالهية السياحية والاثرية . تتميز واحة الازرق بفضارة مياهها العذبة التي تصل اليها من ينابيع تجري في باطن الارض وتتجمع هذه المياه في برك يتراوح عمقها بين ٠.٦٥ - ٢.٤ متر، فتنمو على جوانبها الاعشاب وتكثر الاسماك في مياه هذه البرك .

لا تقتصر اهمية الازرق السياحية على وجود قلعة الازرق فقط بل تمتعها الى كون الازرق محطة تتوقف بها الطيور المهاجرة من اوربا الى افريقيا في الخريف ومن افريقيا الى اوربا في الربيع ويجذب هجرة الطيور هذه الى الازرق المئات من عشاق مراقبة الطيور والصيادين . وفي السنوات الاخيرة تم اكتشاف المياه المعدنية الساخنة في الازرق وتم تشجير ما حولها بالاشجار الحرجية واقامت وزارة السياحة وحدات سكنية ومطعم وغيرها من الوسائل الترويحية الاخرى .

١ . هل سمعت عن الازرق قبل قراءة هذه الملحة الموجزه ؟ نعم ☐ لا ☐

٢ . هل زرت الازرق ؟ نعم ☐ لا ☐

٣ . اذا زرت منطقة الازرق ما هي الناحية الممتعه في الازرق ؟

٤ . ما هو الغرض الرئيسي من زيارتك لمنطقة الازرق ؟

٥ . هل لديك ملاحظات وتوصيات من ناحية الاستعمال الترويحي لمتنزه الازرق القومي .

٦ . هل لديك واسطة نقل (سيارة) ؟ نعم ☐ لا ☐

٧ . اذا توفرت واسطة النقل (باص) بسمرخيص (دينارين) للذهاب والاياب الى الازرق فهل تحب ان تزور الازرق ؟ نعم ☐ لا ☐

TABLE 15 : Knowledge of Azraq Park

| Code | Public Answer | Absolute Frequency | Relative Frequency % |
|------|----------------------|--------------------|----------------------|
| 1 | Know the Park | 96 | 96.0 |
| 2 | Do not Know the Park | 4 | 4.0 |
| | | 100 | 100.0 |

From Table 15, out of a sample of 100 respondents, 96.0% know and have heard about Azraq while the remaining 4.0% did not know anything about Azraq Park.

TABLE 16 : Frequency of Visitors to the Park

| Code | Visitation | Absolute Frequency | Relative Frequency % |
|------|--------------------------|--------------------|----------------------|
| 1 | Have been in Azraq | 86 | 86.0 |
| 2 | Have never been in Azraq | 14 | 14.0 |
| | | 100 | 100.0 |

Table 16 shows that 86.0% of the sample have been in Azraq but the remaining 14.0% of the sample have never been there.

TABLE 17 : Public's Major Points of Interest

| Code | Major Interest | Absolute Frequency | Relative Frequency % |
|------|---------------------------------------|--------------------|----------------------|
| 0 | No answers | 8 | 8.0 |
| 1 | Historical monuments | 11 | 11.0 |
| 2 | The pools, fish and migratory birds | 41 | 41.0 |
| 3 | The oasis in the middle of the desert | 6 | 6.0 |
| 4 | Quiet and natural beauty | 18 | 18.0 |
| 5 | Forest trees, garden and date palms | 4 | 4.0 |
| 6 | Shaumari Wildlife Reserve | 3 | 3.0 |
| 7 | The Climate of Azraq | 5 | 5.0 |
| 8 | The presence of saline areas | 1 | 1.0 |
| 9 | Horizontal extension of Azraq | 3 | 3.0 |
| | | 100 | 100.0 |

The results presented in Table 17 show the major interest of the public about Azraq Park. It can be seen that 41.0% of the sample would like to visit Azraq particularly to enjoy the pools, fish and the migratory birds. 18.0% of the sample are looking for the peacefulness and natural beauty of Azraq. 11.0% would like to visit the historical monuments. 8.0% failed to comment, and 6.0% would like to see the oasis in the middle of the Azraq Desert National Park.

TABLE 18 : Purpose of Visit to Azraq by the Public

| Code | Purpose of Visit | Absolute Frequency | Relative Frequency % |
|------|-------------------------------|--------------------|----------------------|
| 0 | No answer | 6 | 6.0 |
| 1 | To have an idea about Azraq | 11 | 11.0 |
| 2 | For tourism | 31 | 31.0 |
| 3 | For recreation | 28 | 28.0 |
| 4 | Scientific trip | 12 | 12.0 |
| 5 | To spend the weekend | 6 | 6.0 |
| 6 | Sport hunting | 1 | 1.0 |
| 7 | Camping | 1 | 1.0 |
| 8 | To see the historical palaces | 4 | 4.0 |
| | | 100 | 100.0 |

The findings given in Table 18 show the main purposes of the public in visiting Azraq. 31.0% of the sample would like to visit Azraq for tourism purposes, 28.0% for recreation, 12.0% would like to visit Azraq for scientific purposes and 11.0% would like to have a look and to have an idea of Azraq.

TABLE 19 : Public Suggestions

| Code | Suggestions | Absolute Frequency | Relative Frequency % |
|------|------------------------------------|--------------------|----------------------|
| 0 | No suggestions | 66 | 66.0 |
| 1 | Tourist facilities | 20 | 20.0 |
| 2 | Keep natural resources from damage | 2 | 2.0 |
| 3 | Complete ban on hunting | 5 | 5.0 |
| 4 | To put the Park under observation | 2 | 2.0 |
| 5 | Accurate maps and tourist guides | 1 | 1.0 |
| 6 | Organise tourist trips | 2 | 2.0 |
| 7 | Playground for children | 2 | 2.0 |
| | | 100 | 100.0 |

The results given in Table 19 show that 66.0% of the sample do not have any suggestions; 20.0% suggested providing tourist facilities; 5.0% suggested a complete ban on hunting within Azraq Park; 2.0% asked to keep the natural resources from damage; 2.0% suggested putting the Park under observation; 2.0% suggested organising touring trips; 2.0% suggested providing the Park with a playground and gardens for children, and finally 1.0% suggested the provision of accurate maps and tourist guides.

TABLE 20 : Preferences to Visit Azraq if Transport is available

| Code | Response | Absolute Frequency | Relative Frequency % |
|------|-------------------------------|--------------------|----------------------|
| 1 | Would like to visit Azraq | 85 | 85.0 |
| 2 | Would not like to visit Azraq | 15 | 15.0 |
| | | 100 | 100.0 |

Despite 48.0% of the sample being car owners 85.0% of the respondents would like to visit Azraq if there is available transport (buses and coaches) at a cheap rate (J.D.2, ca.£3.50) but the remaining 15.0% would not like this.

Conclusions

According to the results the following findings can be stated from the Public Questionnaire.

- (a) Azraq Desert National Park is well known to the majority of the Jordanian public.
- (b) The major interest of the public are the pools, migratory birds, peacefulness and natural beauty of Azraq.
- (c) The main reasons why people visit Azraq are for recreation and tourism. At the same time they want to minimise damaging and destroying the Park.

- (d) The general public suggested that tourist facilities should be provided at Azraq and that there should be a complete ban on hunting. In addition the public wants a conservation of the natural resources, putting the Park under observation, organising trips, providing the Park with gardens (playground) for children and finally, people suggested the provision of accurate maps and tourist guides.

2-9.3 Special Questionnaire for Naturalists, RSCN, the University of Jordan and the Ministry of Agriculture

The third survey was a special questionnaire for naturalists, the members of the R.S.C.N., some staff of the University of Jordan and the Ministry of Agriculture. This survey was conducted in accessible Azraq for all members of the R.S.C.N., who represent a wide range of interests (both sporting and conservationist), and in Amman for some ecology, biology and geography staff at Jordan University, and the Ministry of Agriculture. See examples of the original forms of this questionnaire in Arabic and English on the following pages.

Method of Data Analysis

Data were analysed by tabulation and cross-tabulation as in the previous cases using the computer.

Results of the Special Questionnaire

The results of the special questionnaire can be shown in the following Tables. The analysis is based on 63 respondents.

Azraq Desert National Park
SPECIAL QUESTIONNAIRE

This survey is a part of study of Azraq to assess and reconcile the different uses eg. recreation, scientific use, agriculture and other uses such as military and communication.

I should be grateful if individual visitors or leaders of groups or sportmen would answer the question by ticking or filling in appropriate box or space.

1. Do you like the nature? If yes Why ?
- 2- Would you like to see any more facilities within the boundaries of Azraq Desert National Park?
3. Why do you consider Azraq as a site of special scientific interest (SSST)?
4. What would you like to see at Azraq park?

| | | | | | |
|---------------------------------|--------------------------|-------------------|--------------------------|-------------------------|--------------------------|
| Allow hunting all over the year | <input type="checkbox"/> | Organised hunting | <input type="checkbox"/> | Complete ban of hunting | <input type="checkbox"/> |
|---------------------------------|--------------------------|-------------------|--------------------------|-------------------------|--------------------------|
5. What do you think the best use of Azraq Park?

| | | | |
|---|--------------------------|---|--------------------------|
| Nature conservation national park | <input type="checkbox"/> | Recreation National Park | <input type="checkbox"/> |
| Research & scientific purpose national park | <input type="checkbox"/> | Multiple purpose N.P including Nature conservation, recreation scientific use and agriculture | <input type="checkbox"/> |
6. Is there any rare species of flora and fauna at Azraq?
7. From your point of view what is the main interesting thing at Azraq Desert national Park?
8. According to the new establishment of Shaumari Wildlife Reserve, would you like to see another reserves: i.e pool reserve?

استفتاء خاص بمحبي الطبيعة وأعضاء الجمعية الملكية
لحماية الطبيعة والجامعة الاردنية

١. هل انت من محبي الطبيعة ؟ نعم ☐ لا ☐

٢. لماذا تحب الطبيعة ؟
.....

٣. هل تحبذ اية خدمات اضافية للترويج عن النفس ضمن حدود متنزه الازرق القومي ؟
.....

٤. هل تعتبر منطقة الازرق موقعا ذات اهمية علمية خاصة ؟ نعم ☐ لا ☐

٥. هل تحبذ السماح بممارسة هواية الصيد في الازرق ؟ نعم ☐ لا ☐

في حالة الاجابة بنعم اي نوع من الصيد تفضل

فتح المنطقة للصيد على مدار السنة ☐ صيد منظم ضمن القانون ☐
دون قيود

منع الصيد منعاً باتاً ☐

٦. ما هو برأيك الاستغلال الامثل لمنطقة الازرق ؟

متنزه قومي ترويجي ☐ منطقة مغلقة لحماية الطبيعة ☐

متنزه قومي لفرض الابحاث العلمية ☐

متنزه قومي متعدد الأغراض لحماية الطبيعة ☐
والترويج عن النفس والاستعمال العلمي
والزراعي

٧. هل تعتقد بوجود انواع نادرة من المجموعة النباتية والحيوانية البرية في منطقة الازرق ؟
.....

٨. من وجهة نظرك ما هي الاهمية الرئيسية لمتنزه الازرق القومي ؟
.....

٩. هل تفضل تخصيص مواقع اخرى عدا محمية الشومري لأغراض حماية الطبيعة ؟
.....
.....
.....

All the 63 respondents like nature for many reasons: it represents beauty, it is quiet and peaceful and reminds them of God the Creator.

TABLE 21 : Preference of Facilities

| Code | Preference of Facilities | Absolute Frequency | Relative Frequency % |
|------|--|--------------------|----------------------|
| 0 | No answer | 11 | 17.5 |
| 1 | Tourism facilities | 28 | 44.4 |
| 2 | To establish an entertainment city | 1 | 1.6 |
| 3 | Horse riding fields | 6 | 9.5 |
| 4 | Brings the wild animals to Shaumari Reserve | 1 | 1.6 |
| 5 | Training fields for shooting | 1 | 1.6 |
| 6 | Encourage scientific research | 1 | 1.6 |
| 7 | Camping sites for recreation | 3 | 4.8 |
| 8 | Build roads to gain access to historical palaces | 1 | 1.6 |
| 9 | Allow hunting throughout the year | 10 | 15.9 |
| | | 63 | 100.0 |

Table 21 shows the facilities demanded within the Azraq Park. 44.4% of the sample would like to see tourist facilities - Rest houses, Restaurant, lavatories and camping areas - while 17.5% refrained from answering. 15.9% preferred to allow hunting throughout the year, and 9.5% asked for horse riding fields. 96.8% of the sample considered Azraq as a Site of Special Scientific Interest (SSSI) while the remaining 3.2% did not answer.

TABLE 22 : Attitudes to Hunting in the Park

| Code | Opinions | Absolute Frequency | Relative Frequency % |
|------|-----------------------------------|--------------------|----------------------|
| 1 | Allow hunting throughout the year | 14 | 22.2 |
| 2 | Organised hunting | 17 | 27.0 |
| 3 | Complete ban on hunting | 32 | 50.8 |
| | | 63 | 100.0 |

The results presented in Table 22 show that 50.8% of the sample wanted a complete ban on hunting, 27.0% wanted organised hunting, while the remaining 22.2% favoured hunting throughout the year within the Azraq Desert National Park.

TABLE 23 : Scores for preferred Uses of the Park

| Code | Preferences | Absolute Frequency | Relative Frequency % |
|------|---------------------------------------|--------------------|----------------------|
| 1 | Nature Conservation National Park | 17 | 27.0 |
| 2 | Recreation National Park | 4 | 6.3 |
| 3 | Research and Scientific National Park | 4 | 6.3 |
| 4 | Multiple-use National Park | 38 | 60.3 |
| | | 63 | 100.0 |

The findings given in Table 23 show that 60.3% of the sample wanted Azraq as a multiple-use National Park, 6.3% wanted Azraq as a recreation National Park, 6.3% wanted it for a science and research National Park, while the remaining 27.0% wanted it as a nature conservation National Park.

96.8% of the sample agreed that there are rare species of flora and fauna at Azraq while the remaining 3.2% did not agree.

TABLE 24 : Major Points of Interest

| Code | Major Interests | Absolute Frequency | Relative Frequency % |
|------|---|--------------------|----------------------|
| 0 | No answer | 2 | 3.2 |
| 1 | Azraq is unique case in Jordan | 1 | 1.6 |
| 2 | Azraq climate | 2 | 3.2 |
| 3 | Renew the resources of Azraq to be productive | 3 | 4.8 |
| 4 | Potable, Saline and hot mineral waters | 26 | 41.3 |
| 5 | Tourist and archaeological zones | 13 | 20.6 |
| 6 | The green oasis in the desert | 10 | 15.9 |
| 7 | Migratory birds and wild animals | 6 | 9.5 |
| | | 63 | 100.0 |

Table 24 illustrates the major points of interest in the Park. 41.3% of the sample showed interest in Azraq because of the

presence of the potable water, saline water and hot mineral water. 20.6% were interested in the occurrence of tourist and archaeological zones. 15.9% liked the presence of the green oasis in the middle of the desert. 9.5% admired the presence of the migratory birds and wild animals, and 4.8% agreed that the resources in Azraq are down-grading and suggested renewing the resources.

TABLE 25 : Suggestions for New Reserves

| Code | Suggestions | Absolute Frequency | Relative Frequency % |
|------|---|--------------------|----------------------|
| 0 | Would not like more Reserves | 12 | 19.0 |
| 1 | The pools Reserve | 9 | 14.3 |
| 2 | Wadi Rum in Southern Jordan | 1 | 1.6 |
| 3 | More Reserves to cover Azraq area | 9 | 14.3 |
| 4 | Specific areas for research | 5 | 7.9 |
| 5 | Reserves in Wadi Butum | 1 | 1.6 |
| 6 | Replace Azraq Park by new Reserves | 20 | 31.7 |
| 7 | More Reserves after developing Shaumari Reserve | 6 | 9.5 |
| | | 63 | 100.0 |

Table 25 illustrates the suggestions for new Reserves in Jordan. Azraq Park is full of motion and activity, so it is necessary to establish an alternative Reserve. 19.0% would not like more Reserves, 14.3% want a greater number of Reserves to cover all Azraq. 14.3% want a pools Reserve to protect the waterfowl of

Azraq. 31.7% asked for the replacing of Azraq Park by new Reserves. 9.5% asked for more Reserves only if the experimental Shaumari Wildlife Reserves succeed. 7.9% asked for special areas for scientific research.

Conclusions

The following are the findings from the special questionnaire for naturalists, members of RSCN and some staff from Jordan University and the Ministry of Agriculture:

- (a) The major points of interest are the potable water, hot mineral water and saline water, archaeological sites, the migratory birds and wild animals, and the presence of the green oasis in the middle of the desert.
- (b) Most of the respondents suggested that new Reserves should be established in Azraq because Azraq is becoming full of activity and they expressed the view that special areas for scientific research and studies were necessary.
- (c) 60% of the respondents wanted Azraq Desert National Park as a Multiple-Use National Park.

2-9.4 Informal Recreation

Water is a focal point for outdoor recreation. Most people look for water to swim in, to fish in, to walk beside, picnic and camp by, or just to look at. In general, an area for recreation requires a combination of land and water resources to fulfil the needs and desires of the user. The water may or may not be used physically but it is important if only for scenic appreciation. It is accepted that land without streams, rivers, lakes or oasis is less desirable from the viewpoint of recreational use. The presence of water in a desert area is of particular recreational significance.

Most Jordanians are interested in their natural surroundings and are increasingly able to enjoy outdoor picnics in the family car. The presence of the oasis in Azraq attracts a large number of people during public holidays in spring and summer. The desert sites of antiquity are quite well known and attract many visitors. There are occasional groups who visit Azraq from the University but school parties are more common.

2-9.5 Nature Study

The Azraq oasis is a bird watcher's paradise. In spite of this, few Jordanians are interested in this hobby, but a large proportion of the foreign visitors like to watch the birds in Azraq. A group of post-graduate research students from Jordan University are interested in ecological and biological research in the Azraq area, especially in the Azraq oasis and the scattered wadis within the desert.

2-9.6 Sport Shooting

Three main groups of hunters can be recognised in the Azraq Desert National Park:

- (a) The Bedouin desert dwellers. These are nomadic graziers who, by tradition and habit, are usually armed.
- (b) Druze and Shishan village people, and
- (c) Visitors from different parts of Jordan who visit Azraq for the specific purpose of shooting.

The first two groups probably shoot at all times of the year and kill many species. The visitors shoot birds during fall and winter periods during the migration from Africa to Europe and Asia and vice versa. At present, shooting in the Azraq area is *nominally* under legal control. Hunting is allowed only in the wetland area and within 1 km. of its edges, e.g. Inglesi and Burgess (see Figure 15). Hunting is allowed only on Fridays and Sundays from 1st October to 31st March. The hunting is controlled by the Royal Society for Conservation of Nature (RSCN) an authority delegated by the Minister of Agriculture. Only birds listed on the hunting schedule, e.g. Duck, Waders, Sand Grouse, Squacco Heron, Pratincole and Coot, may be shot and the daily bag is restricted. The RSCN issues licences which cover one year. Hunting throughout Jordan costs J.D.3. Unfortunately these laws are broken due to a number of reasons, some of which are that:

- (1) The hunting laws are not generally understood.
- (2) Hunters cross the boundary from Saudi Arabia to hunt in the Azraq Desert National Park because hunting is banned by Royal decree in Saudi Arabia.
- (3) There is no effective control from the RSCN due to staff shortage - there are only two inspectors to cover the whole of Jordan.

According to the results of the survey by questionnaire which was done in Azraq as part of this project, 51.0% of the respondents want a complete ban on hunting, 27.0% want organised hunting, while 22.0% want hunting throughout the year.

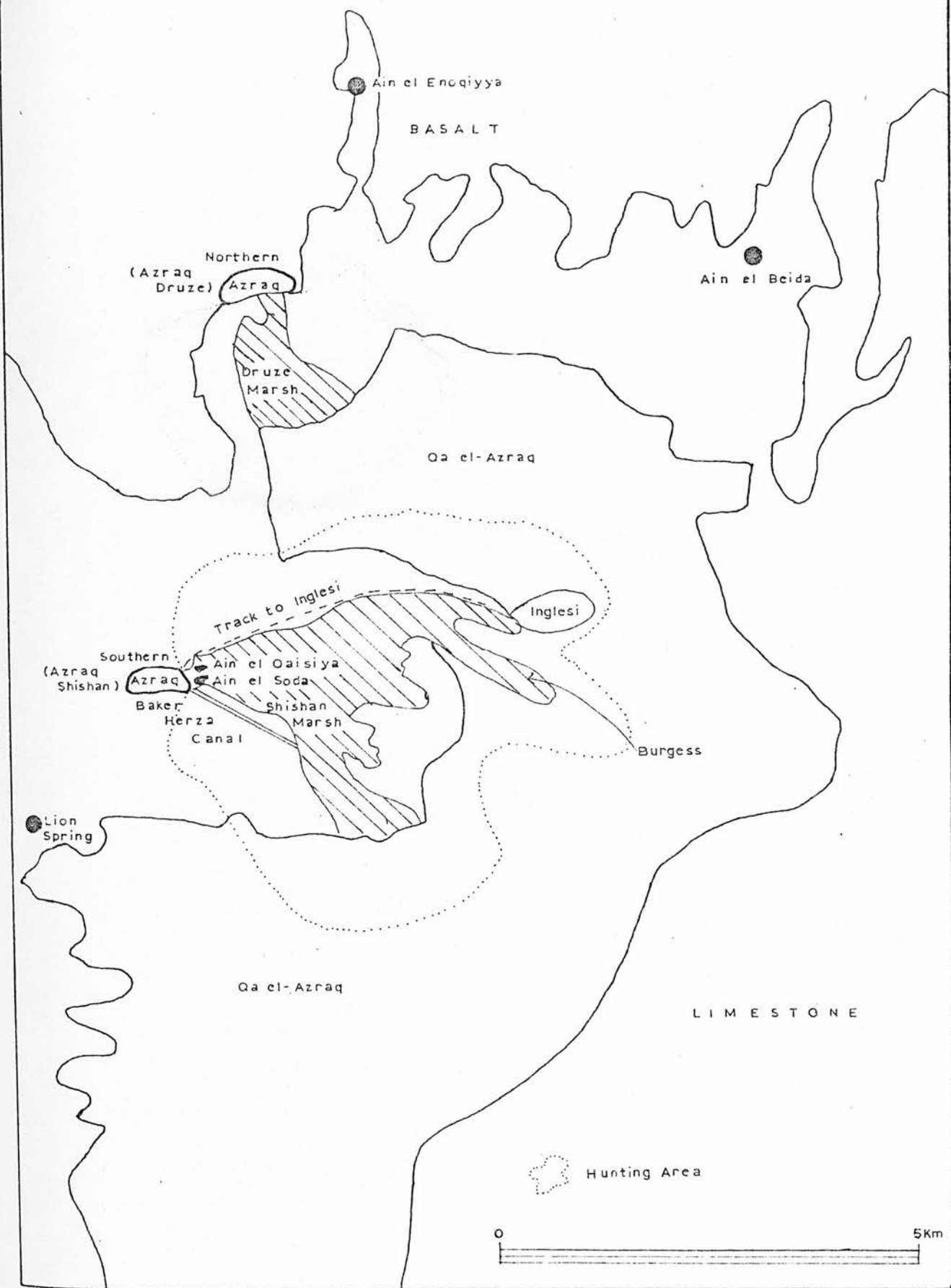


FIGURE 15 : Boundary of hunting areas (after Nelson, 1973)

2-9.7 Archaeology

There are several desert Antiquity sites of great archaeological interest within the Azraq Desert National Park. These antiquities are palaces and they were built between the 4th and 8th centuries. Qasr el Azraq, one of the palaces, was built by the Romans while Qasr Amra and Qasr el Kharana were built later by the Omayyad (see Figure 16). Archaeologists have researched on these sites, but little is known about some of them in the Park, e.g. Qasr Aseikhim and Qasr Uweinid.

Qasr el Azraq

This ancient fortress is located on the north side of the Oasis near Azraq Druze (Northern Azraq). This palace is a large enclosure of about 80 sq.m. with towers at the four corners. Basalt was used by the Romans in building Qasr el Azraq at about A.D. 300 and there is an inscription of Emperor Jovian (A.D. 363) who probably rebuilt part of it, Hemsley (1966). Another Arabic inscription made above its main gate at about A.D. 1236 - 9, shows that it was rebuilt by the Arabs under Izz ed din Aybak during ^{the} crusades. It was used by Lawrence who established his headquarters there during his campaign against the Turks (see Plate 5).

Qasr Amra

Qasr Amra is situated in the wadi Butum about 21 km. southwest of Azraq Shishan. It seems to have been a hunting lodge and a bathing house for the Omayyad. It was built and decorated by one of the Omayyad princes at the beginning of the 8th century in

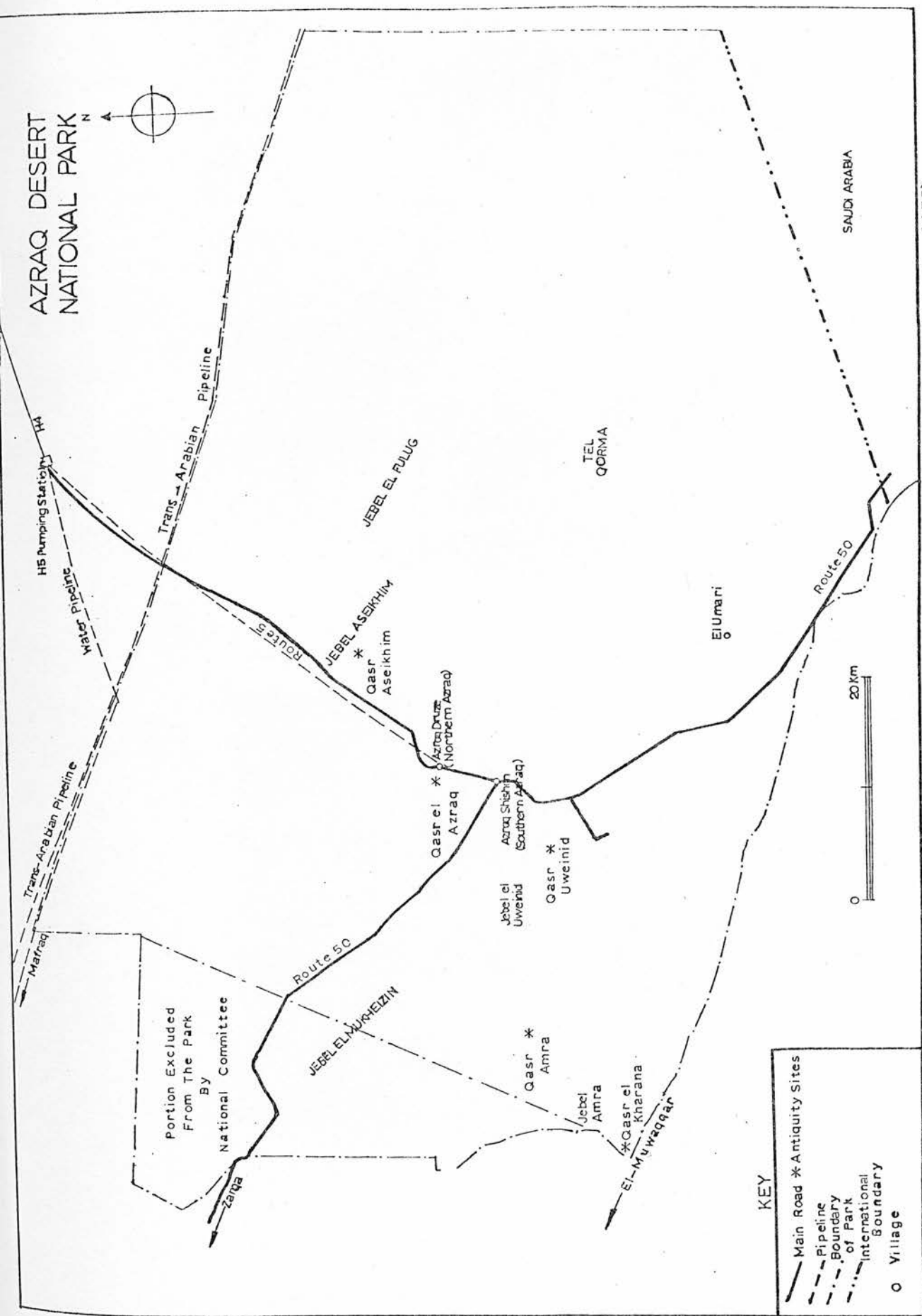


FIGURE 16 : Distribution of historical palaces in Azraq Desert National Park (after Nelson, 1973)



PLATE 5 :

Qasr el Azraq: This is situated in Azraq Druze. It was built by the Romans, rebuilt by Arabs under Izz ed din Aybak during the Crusades, and used by Lawrence in World War I



PLATE 6 :

Qasr Amra: Built by Omayyad in the 8th century. Used as a hunting lodge and baths.

the reign of Walid I. The inside walls are covered with frescoes. The building consists of three parallel vaulted halls with a dark room at the end of each lateral hall, probably for mid-day siesta. Some of the rooms have mosaic floors, but these are at present largely obscured by accumulated debris (see Plate 6).

Qasr el Kharana

This palace is located at the southwestern entrance to the Park and to the southwest of Qasr Amra. This is one of the best preserved palaces. A cufic inscription over a door in the upper storey gives a date A.D. 117, but this is probably not the date of the building (Hoade, 1966). The shape of this palace is square with circular towers at each angle and semi-circular tower in the centre of each wall, except the south one. These towers are purely ornamental.

Qasr Uweinid

Qasr Uweinid is situated on the southern escarpment of Jebel el Uweinid and is shown as a site of the Byzantine period. This palace is in a very ill-preserved condition.

Qasr Aseikhim

Qasr Aseikhim is situated on the summit of Jebel Aseikhim. It is also in a very ill-preserved state of preservation. This site gives a view of the surrounding desert.

At present a large ^{proportion} of tourists seem to penetrate as far as Druze Castle with, perhaps, a stop in the Shishan pools and mineral water area. These tourists come from different parts of the world, including Britain, Germany and Sweden. Local visitors come from Amman and Zarqa for one-day visits. According to the result of the questionnaire survey which was done (this study, 1977), 11.3% of the sample population would like to visit historical antiquities.

2-10 RECREATION AND CONSERVATION MANAGEMENT

There was no concerted management of recreation and conservation before the designation of the Azraq Desert National Park in 1965. In 1966 the Jordanian government accepted the general principles of the Hemsley and George Draft Management Plan, and it has implemented parts of it through three official bodies:

1. Ministry of Tourism and Antiquities

The Tourism and Antiquity Department has been active in respect of care and restoration of the ancient monuments, namely, Qasr el Asraq, Qasr Amra and Qasr el Kharana. All these palaces are now in a good condition for tourism. This Department has also concluded a study of development of the Azraq area as a National Park for recreation purposes. It has set aside an area of land (600 ha. - called Azraq National Park) 3 km. northwest of Azraq Shishan. This area contains hot mineral water, planted trees and

the Department has provided tourist facilities such as a large hotel to accommodate visitors, swimming pool, snack-bar and a large parking area with signposts and signals to control the movement of visitors (Clarke, 1977) and protect all these places of interest, and the historical palaces, through antiquities law.

2. Natural Resources Authority (NRA)

This is an official body having responsibility for water studies including digging wells (bore-holes).

3. Ministry of Agriculture

This Ministry is responsible for agricultural development and the protection of the plants (flora) in the Azraq area through different departments. This Ministry adopted the immediate conservation programme by making laws and regulations, e.g. Agriculture Law No.(20) of 1973 and System No.113 of 1973. These laws are meant to protect the birds, wild animals and to organise their hunting (see Appendix 1). These laws were ratified by the government who vested in the Royal Society for Conservation of Nature (RSCN), a semi-official body, the power for its execution in 1973.

Management achievements up to date include:

1. Designation of the area: In 1965 the total area which was designated as the Azraq Desert National Park was 5,250 km². During the 1970s this area was reduced to about 4,700 km² as a result of excluding the extreme western portion of the Park (see Figure 1b).

2. Protection of the Azraq Desert National Park: The RSCN has so far tried to manage the Azraq Desert National Park by the application of laws which specifically apply to other Ministries, e.g. Tourism and Agriculture. Such laws do not serve the specific needs of the RSCN which would certainly require its own laws for preserving the Azraq Desert National Park. In fact the implementation of the present laws does not meet the demand due to many reasons:

- (a) There is no serious co-operation between the RSCN and other government bodies, especially the police, customs officers, agriculture staff and military personnel who are supposed to enforce adherence to hunting laws.
- (b) There is a lack of enough rangers and officials; there are only two inspectors for the whole National Park.

3. Organised hunting: In 1968 the RSCN had been managing the marsh at Azraq Shishan in relation to the control of hunting season, bags-limits and the general policing of the 'open' season for water birds.

4. Little has been done to protect the flora. The Department of Range and Forests is responsible for exercising grazing control, reed-cutting, firewood and material for fencing and building depends on Agriculture Law No.(20) of 1973.

5. The RSCN has established a number of Reserves connected with specific activities in the Azraq Desert National Park, under the auspices of the International Union for Conservation of Nature and Natural Resources (IUCN) and the World Wildlife Fund (WWF).

Examples are:

1. Shaumari Wildlife Reserve: This reserve was established in Shaumari about 13 km. to the south of Azraq Shishan. Its total area of about 2,200 ha. has been fenced with barbed wire. The main purpose of this reserve is to accommodate imported species of birds and animals whose species had become extinct in Jordan and to have them re-introduced into the country.
2. Azraq Waterfowl Reserve: This is a new Reserve of about 1,400 ha. and includes the marsh terrain to the east of Azraq Shishan. It is not fenced yet but is has legal protection. This Reserve is an important area for migrating birds and waterfowl and is of scientific interest. There are four new proposed Reserves in different parts of the Azraq Desert National Park (see Table 29).

Conclusion

The general conclusion is that while the Jordanian government has indicated its intentions by approving the Hemsley and George Management Plan it has not yet succeeded in implementing the Royal Decree of 26th July, 1965. Most noticeable is the lack of overall control and enforcement of the agreed policies.

PART 3

EVALUATION OF THE
AZRAQ DESERT NATIONAL PARK
FOR VARIOUS USES

PART 3 :

EVALUATION OF THE AZRAQ DESERT NATIONAL PARK FOR VARIOUS USES

The purpose of this section is to assess the value of the Azraq Desert National Park for the different uses to which the Park is put.

3-1 VALUE FOR ARABLE AGRICULTURE

The agricultural value of the lands within the Azraq Desert National Park is limited by the sparsity of the rainfall. Arable agriculture is therefore dependent on the supply of water for irrigation. Furthermore, many of the soils are so poor that they would not yield adequate crops under irrigation. In general the soil in the Azraq Desert National Park is poor except the relatively limited area of the silty dune soil very close to Azraq Druze (to the south and east of Azraq Druze, see Figure 17). This soil gives good production after adequate leaching of excess salts. Other areas are unsuitable because of the heaviness of their soils and the consequent poor drainage, the high salt content or the low level of nutrients.

There is no constant source to supply water to Azraq Oasis because the recharge to the aquifers is at the mercy of nature (from the annual rainfall in Jebel Druze - Syria). According to Mudallal (1967) the potential water in Azraq is about 30 MCM/year. He also estimated the abstraction of water from the aquifers to be 24 MCM/year. Only 0.5 MCM/year is used for local consumption in Azraq and 1.5 MCM/year for municipal consumption in the Northern District (Irbid). Evapotranspiration is 5.7 MCM/year. In fact there is 16.3 MCM/year surplus water which can be used in the marshes outside the spring area without affecting the hydraulic balance of the aquifers in the area. Thus the surplus water can be saved for municipal or industrial needs. If urgent needs for water occur in the future the water abstraction would have to be increased. The water in Azraq is sufficient for local and municipal needs, but the consumption has been rising rapidly during the last few years.

To discuss the situation of Azraq water in the next ten years one must refer to Mudallal's estimation. The estimation of the municipal consumption to Irbid was 4200 m³/day (equal to 1.5 MCM/year). The municipal consumption in July 1977 was 7200 m³/day (equal to 2.6 MCM/year). If the increment is considered as the same ratio, that means the municipal consumption in 1987 will probably be 10,200 m³/day (equal to 3.7 MCM/year). This amount would not affect the balance of the aquifers because Mudallal estimated the saving of water to be 6 MCM/year. On the other hand the water level of the pools was noticed to be going down year after year and this may

indicate a shortage of water in the future. There is a fear that if too much water is withdrawn the effect on the wetland will be great and irreversible by the time it becomes apparent. Another important aspect - the underground changes owing to altered levels - might lead to contamination of the potable water with brine water. From the nature conservation point of view the oasis water level should be constant for continued presence of the flora and the wildlife in the Azraq Oasis.

3-3 VALUE FOR NOMADIC PASTORALISM

Nomadic pastoralism depends mainly on pasturage and water. The value of the Azraq Desert National Park for nomadic grazing is due to the fulfilment of these conditions over a large area of land in the semi-arid zone. Azraq Park provides a sparse and dry vegetation with a limited supply of water at the desert watering points. Therefore Azraq is well suited to the traditional pattern of nomadic grazing. However in recent years there has been an increase in the size of the herds. Because of this the grazing does not have time to recover. As a result of this over-grazing by the livestock the plant cover and potential herbage productivity is much reduced and there is evidence of dying out of some plant cover as well as a depletion of water - resulting eventually in a destructive habitat. The area has a value for a limited number of livestock only.

The value of Azraq for livestock farming depends mainly on the presence of the Azraq Druze and Shishan marshes which contain different kinds of edible species. Livestock graze freely in the marshes all year round, apart from the livestock kept in the enclosures of the controlled farming scheme. These enclosures are surrounded by barbed wires or spiny plants. In addition nomadic Bedouins periodically bring camels and sheep to be grazed and watered in the marshes. Thus, Azraq is a suitable area for livestock farming to a limited extent, since there are marsh and silty dune areas to the east and to the south of Azraq Druze (see Figure 17). This is because the day range of the livestock between the marshes and the livestock holding units (in Azraq villages and the silty dune country) is less than 2 - 3 miles. Therefore the Azraq areas is favourable for small scale livestock farming.

Azraq has a great salt extraction value due to the presence of Qa el Azraq which overlies a brine field so concentrated that hundreds of tons of salt are extracted each year. Salt is extracted from four restricted parts distributed in Qa el Azraq. Extraction to date has been done from approximately a tenth of the total area of Qa el Azraq. Salt production in 1969 was 11,700 tonnes- ca. 90,000 sacks of 130 kg., Nelson (1973). The custom tax return was J.D. 6,750 (\equiv £11,250). Salt production increased in 1976 after

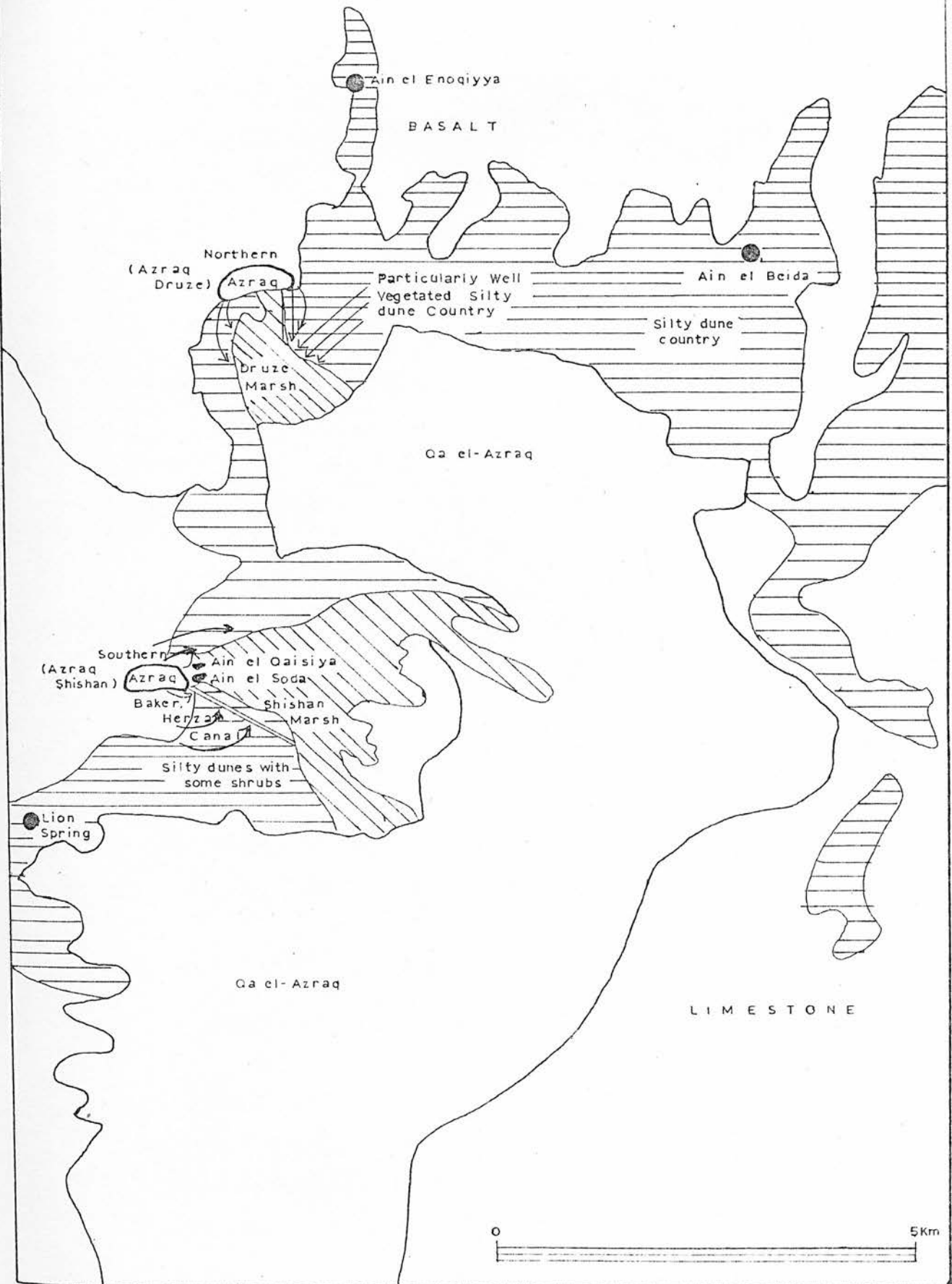


FIGURE 17 : Daily Movement of Livestock from Azraq Villages and Silty Dune Country to Azraq Marshes (after Nelson, 1973)

the establishment of Azraq Co-operative Society in 1975. The production then was 19,600 tons (ca. 140,000 sacks of 140 kg.). This amount was sold for J.D. 126,000 at 900 Fils/sack.¹ The Azraq Co-operative Society achieved a profit of J.D. 49,703 (ca. £82,000). The level of production depends on government policy. If the government decides to maintain the present level it should continue the restriction of licences to Druze and Shishan inhabitants only. In order to increase the current level, issuing of licences should be more liberal.

3-6 VALUE FOR MILITARY USE

The value of the Azraq Desert National Park for military use lies in its strategic location in the Arab world. Azraq has a considerable importance in connection with national security. Military use of the area is therefore inevitable, although this is not in the best interests of the Azraq Desert National Park.

3-7 VALUE FOR ROAD COMMUNICATION

The communication importance of Azraq is due to its geographical location. It is a cross-road linking all neighbouring Arab countries - Syria, Iraq and Saudi Arabia. It therefore makes Arab inter-state communication easy and quick. It also connects the Arab world with European countries.

¹ One Jordan Dinar (J.D.) = 1,000 Fils.

3-8 VALUE FOR ARCHAEOLOGY

Azraq has archaeological importance due to the presence of historical palaces like Qasr Amra, Kharana and Qasr el Azraq. These historical palaces of Azraq attract many Jordanians as well as foreign visitors with special interest, particularly in archaeology and natural history. Because Azraq is one of the most important tourist places in Jordan, tourists like to visit the ancient Roman Empire palace (of the 4th century A.D.) and the Omayyad Palaces (of the 8th century A.D.). Moreover the presence of the highway, Amman-Zarqa-Azraq, will enable tourists to reach the palaces in the comparatively short time of about two hours.

3-9 VALUE FOR NATURE CONSERVATION

The value of Azraq for nature conservation fulfils a number of criteria given by Ratcliffe (1971).

3-9.1 Extent

The total area of Azraq Desert National Park is about 4,700 sq.km., after excluding the western portion of about 550 sq. km. The area of Azraq Park is large enough to provide a habitat for a viable population of plants and animals. The area of the Park forms 37% of the drainage basin in the whole area.

3-9.2 Diversity

Azraq Park shows a wide range of diversity, within the desert mode, e.g. topographic variation, drainage pattern, wadis

spread and three desert types (limestone, basalt and saline). Moreover the vegetation shows a contrast between marshland and the nearby Hammada desert. The range of salinity between Azraq springs and the Qa el Azraq (saline salt-flat) is wide and, finally, seasonal lakes are present.

3-9.3 Naturalness

Human interference in the Park modified the natural condition. Human activities - such as abstraction of water by pumping and construction of pipelines over a long stretch to facilitate water transportation from Azraq to Irbid, extensive grazing, setting up of camps by the nomadic graziers and salt extraction - have changed the natural condition of long ago and the process is still continuing at an alarming rate.

Semi-natural marshes are still characterized by reed mace, giant reed, cane (reed), and prickly sea rush. The extent of vegetation is getting reduced and in due course the plants may completely disappear from the area due to biotic interference.

Pistacia atalantica, an indigenous species, was in abundance in the past but only a few representatives now survive along seasonal water courses in wadi Butum. Other sites indicate an extremely unfavourable condition for survival.

Wild animals/birds like the gazelle and houbara bustard were once abundant in the area in large numbers. Today these species may be facing extinction owing to continuous and indiscriminate shooting.

The salt industry, in the small and localised area of Qa el Azraq, and the insignificant activities there, are not likely to affect the natural condition when compared with the vastness of the Park.

3-9.4 Representativeness

Azraq Oasis has a great value in attracting visitors and bird watchers. The marshes of both Shishan and Druze serve as an abode for fish, birds and various aquatic plants. The oasis exerts a tremendous influence in preserving and maintaining the ecosystem extending over large areas in the desert. In its absence the entire biotic community would have undergone a modification long before now. This has necessitated the preservation of the site containing the oasis.

Azraq desert is characterised by wadis containing various species and wadis play a significant role in maintaining the habitat and in perpetuating the existing rich vegetation. The wadis are actually 'foci' for abundance of biotic life in contrast to the rest of the desert area.

3-9.5 Research and Educational Value

Azraq is uniquely suited for ecological and biological studies on the desert flora and fauna, due to the presence of different kinds of desert features within Azraq Park. Such features

include different kinds of vegetation, the occurrence of freshwater, saline mudflats and brine water.

3-9.6 Potential Value

Azraq Desert National Park once supported vast numbers of wild animals and plants. It still contains multifarious types of plants and animals. It is therefore potentially suitable for development as a National Park or as a Nature Reserve. The re-introduction of different species of wild animals in the Shaumari Wildlife Reserve best illustrates the potentiality value of Azraq area as a National Park or as a Nature Reserve.

3-9.7 Conclusions on Value for Nature Conservation

Considering the discussion on the criteria earlier listed, the 4,700 sq.km., of the Azraq Desert National Park seems a suitable choice for nature conservation. Azraq desert, containing oasis and rich flora and fauna, makes the area a unique site in Jordan for the preservation of indigenous vegetation, wildlife and characteristic features of the desert condition. It is therefore most suitable to maintain as a National Park or Nature Reserve.

3-10 VALUE FOR RECREATION

Azraq is of particular interest to Jordanians as well as foreigners due to many reasons. These include:

(a) Accessibility: The development of the road system already makes Azraq a popular place for visitors from the capital Amman, Zarqa and other urban centres. Most of the people have their own cars which make it possible to reach Azraq pools from Amman in about one-and-a-half hours.

(b) The springs at Azraq are the focal point in the Azraq Desert National Park and are considered the key to man's presence in the desert. The springs attract many visitors regularly.

(c) Special displays showing the significance of Azraq Oasis to migrating birds: Azraq Oasis has a capacity for more than 300,000 ducks each season (Nelson, 1973). Therefore Azraq meets the International criterion for Wetland and Waterfowl conservation. This fact attracts many bird watchers and hunters, especially when hunting is permitted.

(d) The natural beauty of Azraq: The presence of the Oasis in the middle of the desert, the quiet and the natural beauty of Azraq - pools, fish, reeds, forest trees, gardens, and date palms, and the vastness of Azraq, are jointly responsible for enhancing the recreational value of Azraq.

(e) The desert historical sites: Qasr Amra, Qasr Kharana and Qasr el Azraq are quite well known places and are regularly visited by Jordanians as well as the foreign tourists. The pressure on

Azraq Desert National Park is less than that of Dibbeen National Park. It is reported that a Friday in summer-time can witness an influx of about 12,000 people. The formal picnic sites cannot hold this number because their capacity is equal to a tenth of this volume. Visitors to Dibbeen spread themselves out amongst the trees.

3-11 CONCLUSIONS

The Azraq area has a considerable value for a wide range of uses. Arable agriculture, livestock farming, nomadic pastoralism, water abstraction, salt extraction, military use, communications, nature conservation archaeology and recreation. While the established uses are causing concern in places, all have a legal right to continue on the basis of customary use or government licence. Furthermore, some of the "non conservational" uses, e.g. water abstraction, communications and military use, are a national necessity.

PART 4

I N T E R A C T I O N O F V A R I O U S U S E S

PART 4 :

I N T E R A C T I O N O F V A R I O U S U S E S

The main purpose of this section is to investigate the interactions between the different uses in the Azraq Desert National Park. The following table enables us to identify the major interactions which are discussed subsequently. The items listed across the page are considered as active uses and their effect on each of the uses in the vertical column are considered in turn.

4-1 T H E E F F E C T O F A R A B L E A G R I C U L T U R E

Arable agriculture occupies the best land of the Park. It covers about 1312 ha. to the east and to the south of Azraq Druze - silty dune soil - (see Figure 11). The land previously contained palatable range species. This land gives good results after adequate leaching. Water supply is from private boreholes within the farms, but some farms which are close to the pools obtain their water from the Druze and Shishan pools. Arable agriculture has a major effect on nomadic pastoralism, water abstraction, salt extraction and nature conservation. It has also a minor effect on recreation. In the case of nomadic pastoralism, the impact is due to the occupation of the best land by arable agriculture, and this conflicts with the

TABLE 26 : Interactions of Various Uses

| Active Passive | Arable Agriculture | Livestock Farming | Nomadic Pastoralism | Water Abstraction | Salt Extraction | Military Use | Road Communication | Recreation | Nature Conservation |
|----------------------------|-----------------------|----------------------|------------------------|----------------------|--------------------|-----------------|-----------------------|------------|------------------------|
| Arable Agriculture | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Livestock Farming | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Nomadic Pastoralism | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Water Abstraction | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Salt Extraction | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Military Use | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Road Communi- cation | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Recreation | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| Nature Conservation | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |

KEY: 0 = Minor or no effect (not significant)

1 = Major effect (significant)

demands of nomadic pastoralism (pasturage and water). Thus any extension to the agriculture lands will diminish lands available for grazing.

As far as the effect of arable agriculture on water abstraction is concerned, this is due to the use of water for irrigation, especially in the area to the east and to the south of Azraq Druze which needs a great amount of water. Mudallal, (1967) has estimated this amount to be 0.5 MCM/year. At the present time the demand for water is much greater and may be as much as 1.5 MCM/year, due to the digging of many new wells in this area. Heavy use of water from the wells and the pools for agricultural purposes probably reduces the water in the shallow aquifer and might also effect the deep aquifer which feeds Azraq pools. This may reflect badly on the marshes of Druze and Shishan as well as on the Northern District (Irbid) which may then experience a water shortage.

The effect of arable agriculture on salt extraction becomes obvious after leaching operation of the agricultural land (silty dune soil) at an elevation of about 550 m. This land lies to the east and south of Azraq Druze. The saline drainage water (from leaching) will accumulate in the low land of Qa el Azraq (site from which salt is extracted) at an elevation of about 500 m. This possibly increases the concentration of salt in the area and may result in the production of more solid salts. However, it could also lead to contamination of the potable water in the marshes which are very close to the Qa el Azraq.

The total area of arable agriculture in Azraq hinders nature conservation. This arises mainly as a result of cultivation of the parkland (natural land). This conversion may damage the wild flora and fauna in that area and also deplete the fertility of these lands. However, the plants, animals and the ecological relationships are important parts of the natural resources both for enjoyment and for maintaining the biome. Finally, arable agriculture has a minor effect on recreation because most of Azraq farms are model farms. Each farm is surrounded by shelter belt trees and fenced by barbed wire. Most of the visitors come to Azraq to enjoy this landscape and scenic views. In this case arable agriculture in Azraq attracts many Jordanian visitors.

4-2 THE EFFECT OF LIVESTOCK FARMING

Livestock farming has an important major effect on nomadic pastoralism and nature conservation. It also has a minor effect on recreation. There is competition between the uncontrolled livestock and nomadic pastoralism over vegetation and water, especially near the springs around Azraq. The major springs involved are Ain el Anoqiyya, Ain el Bedia and Lion Spring, as well as the marshes of Druze and Shishan (see Figure 12). There is no effect between the controlled livestock and nomadic pastoralism because the former are raised in fenced farms around Azraq villages. It is easy enough to see why there is a major effect between livestock and nature conservation. The former tends to damage the habitat by

intensive grazing and browsing whilst the latter is concerned with its conservation in the oasis around Azraq marshes (see Figure 17) as well as in the spread wadis - Wadi Rajil, Butum, Ratam, Shaumari, and Wadi Aseikhim (see Figure 4). The effect of live-stock activity, by damaging the habitat, may force the wild animals to emigrate from Azraq to other zones. Moreover, there is a minor effect between livestock and recreation around Azraq Druze and Azraq Shishan and their marshes. This effect manifests when the livestock herds are wandering in the area around the villages and the marshes for grazing and browsing. Animal droppings in these areas give a bad impression and view to the visitors who have come to see and enjoy the Azraq Oasis.

4-3 THE EFFECT OF NOMADIC PASTORALISM

Nomadic pastoralism has a major effect on water abstraction due to the large number of herds. The herds, owned by nomadic pastoralists, use a lot of water. They are watering at Ain el Bedia, Ain el Anoqiyya and Lion Spring (see Figure 12) and at the boreholes of the desert, e.g. El Hazim and El Umari (see Figure 8). The desert watering points are focal points for the nomads as they pass through the Park or during their encampment there. Over-use of this water source by nomads probably pollutes the water and makes it unsuitable for local consumption since water pollution could cause health problems in the surrounding area. As long as there is a major effect between nomadic pastoralism and nature conservation, it

is feared that grazing within the Park by the huge number of herds might damage the vegetation of the Park. Apart from the threat to the few rare grass species, nomadic pastoralism is likely, as a result of the heavy use of the water resources and camping, to mar the natural beauty of the Park.

4-4 THE EFFECT OF WATER ABSTRACTION

Water abstraction has a major effect on arable agriculture, nomadic pastoralism, salt extraction, recreation and nature conservation. The effect of water abstraction on arable agriculture arises because the shallow water of Azraq aquifer is used for irrigated agriculture. At the same time the demand for water is growing especially in the Northern District (Irbid) and there is no other source of water to meet this demand. Continued diversion of water from deep aquifer could lead to a lowering of the water table in the (shallow aquifer) agricultural area. This may eventually leave insufficient water for irrigation. Water abstraction has an effect on nomadic pastoralism because it is believed that the heavy extraction of water for local consumption in Azraq villages and municipal consumption in Irbid may cause acute water shortage, the effect of which would be catastrophic for human beings and nomadic pastoralism.

The effect of water abstraction on salt extraction probably occurs when a great amount of potable water is extracted to outside

Azraq area: the water table will then be low. Saline water may then encroach from high water table in Qa el Azraq which surrounds the springs area and may contaminate the potable water in Azraq springs.

Water abstraction has an important effect on recreation. The presence of water in Azraq Oasis is the most important factor in attracting visitors as well as the hunters from Amman, the capital, and from remote areas, to the Park for recreational purposes like relaxing, swimming, fishing and hunting. The water of Azraq Oasis also attracts the migratory birds to have rest and food during their movement from Africa to Europe and Asia. The migratory birds attract birdwatchers and hunters to Azraq Oasis in winter and spring. The depletion of Azraq water will automatically seriously reduce the recreational value of the Park.

Finally water abstraction affects nature conservation because water is one of the main natural resources and its distribution controls that of the plants and animals. Extraction of it for multiple-purposes will surely interfere with the aims of nature conservation. The heavy extraction and consumption will reduce the water content and may affect the balance of nature, most particularly Azraq marshes flora and fauna.

4-5 THE EFFECT OF SALT EXTRACTION

Salt extraction from Qa el Azraq does not have any major effect on any of the other uses in the Azraq Desert National Park.

4-6 THE EFFECT OF MILITARY USE

Military use has a major effect on water abstraction, road communication and recreation. It has also a major effect on nature conservation. In the case of water abstraction, Azraq military base needs a great amount of water. If there is a shortage of water in Azraq the military base will face a serious problem of drought and would probably obtain it at the expense of some other interest.

The effect of military use on road communication stems from the heavy transportation between the military base to Amman, Zarqa and Irbid. In addition there is a heavy use of the roads between Azraq and the Mafraq-Zarqa road (see Figure 14). Its effect on recreation is apparent when the movement of the visitors to Azraq is strictly controlled. Visitors are not allowed to wander freely in the interest of security. Military use has a major effect on nature conservation because the military aircraft fly over the Park at low altitude. This will create excessive noise. It is very likely to frighten the wildlife species, thereby affecting their behaviour. The animals might then be prone to emigration.

4-7 THE EFFECT OF ROAD COMMUNICATION

Road communication has a major effect on arable agriculture, recreation and nature conservation. In the case of arable agriculture the distribution of agricultural products depends directly on the availability of good access roads from the agricultural areas in the southern and the eastern part of Azraq Druze to the central markets in Amman, Zarqa and Irbid. Its effect on recreation arises because the roads are needed by visitors to gain access from Amman and other urban centres to Azraq Park. Roads are also needed to move without hinderance within the Park. This will enhance the recreational pleasure which visitors have come to derive. Road communication and nature conservation are in conflict because the roads provide a good access for the visitors and inhabitants to reach remote areas in the Park and upset the ecosystem by disturbing and even hunting the wildlife animals as well as tapping the vegetation for domestic uses.

4-8 THE EFFECT OF RECREATION

Recreation has a major effect on nature conservation. This is because the Azraq Oasis attracts a large number of visitors and school parties during the weekends and public holidays in spring and summer time. These visitors come for recreation and engaging in swimming and picnicking. These activities disturb the birds as well as the wild animals, because they unintentionally interfere with nature.

4-9 THE EFFECT OF NATURE CONSERVATION

Although nature conservation does not have a major physical effect on the other uses which are mentioned above, it has an effect on legal rights over an area, such as restricting the legal rights of the inhabitants of the desert and the Azraq villages.

4-10 DISCUSSION OF MAIN INTERACTIONS

The abstraction of water from Azraq pools for local and municipal consumption reduces the water content of the pools. This effects badly on the marshes community of the Azraq pools. Therefore, water balance in Azraq marshes should be maintained for wild animals, migrating birds and the flora. The effect of water abstraction on arable agriculture becomes apparent with continued diversion of water from deep aquifer to the Northern District - Irbid. This could lead to a decrease in the water content of shallow aquifer which is used for irrigated agriculture in the Azraq area. Moreover, the abstraction of water could also lead to contamination of the potable water in the marshes by the brine water from the vicinity of Qa el Azraq.

Nomadic pastoralism has a great effect on natural vegetation of the Park by the huge number of the nomads' herds. This will not give the vegetation a chance to recover in the area.

The livestock herds also use the desert watering points when the nomads pass through the Park or during their encampment there. The usage of this water by the nomads' herds probably pollutes the water. This could cause health problems in the area. Any attempt by the government to dig or encourage the digging of new wells in the area will disturb the biological balance of the Azraq area and encourage destructive use of the area. It seems that the government policy is not to give any permission to dig any well in the Azraq area. This is a wise conservation step by the government.

From the recreation point of view, a large number of visitors and school parties come to Azraq during the weekends and holidays in spring and summer. The visitors' activities disturb and interfere with the natural ecosystem of the Park. Thus such human activities and their movement should be controlled within the Park to reduce the conflict between recreation and nature conservation.

Although military use and road communication conflict with the interests of the nature conservation of the Park they are considered a national necessity in the Azraq area.

PART 5

IDENTIFICATION OF THE
PROBLEMS OF THE
AZRAQ DESERT NATIONAL PARK

PART 5 : IDENTIFICATION OF THE
PROBLEMS OF THE AZRAQ
DESERT NATIONAL PARK

5-1 NATIONAL PARK CONCEPTS

5-1.1 United States Origins

The National Park concept is a little over 100 years old. The first National Park was established at Yellowstone in Wyoming, U.S.A. in 1872. The idea of National Parks originated in the U.S.A. before Europe because the latter was gradually adapting itself to the effects of the industrial and agricultural revolutions which extended over a long period until the 19th century, while in the U.S.A. land development advanced rapidly after the settlement of the new inhabitants in the States in the 17th century. The Act of March 1, 1872, dedicated and set apart the Yellowstone region as "a public park or pleasure-ground for the benefit and enjoyment of people".

The Act provided for the preservation of timber and other forest resources, minerals, geological formations, sites of outstanding beauty, and made provision for their maintenance in a natural condition. Provision was also made for the preservation of wildlife and other tourist attractions. The Act prohibited human

settlement or other modifications within the area earmarked for the Park. At present the total number of National Parks established by different nations of the world exceeds 1,200, but the credit for the original idea and the main advances in this field can be claimed by the U.S.A. This concept has also received much attention in Canada, Australia, south and eastern Africa and the U.S.S.R. A different kind of National Park has been established by France and the U.K. and a number of other developed countries. These Parks may be characterised as Multiple-Use Parks. In terms of the percentage of their land area designated as National Parks, New Zealand (8.34%) and Zambia (8.12%) lead the world. The high percentage in these two countries is probably a function of their comparatively low human population density.

5-1.2 IUCN Definitions

The International Union for Conservation of Nature and Natural Resources (IUCN) was established at Morges, Switzerland in 1948 and its International Commission on National Parks (ICNP) was established at Delphi, Greece in 1958. Since their establishment they have been working on definition of the term "National Park" in cooperation with various governments and international organizations.

An internationally accepted definition of the term "National Park" was approved by The 10th General Assembly of IUCN held at New Delhi in November, 1969. The Assembly considered the

importance given by the United Nations to the National Park concept as a sensible use of natural resources. The General Assembly also recommended

"that all governments agree to reserve the term "National Park" to areas answering the following characteristics and to ensure that their local authorities and private organisations wishing to set aside nature reserves do the same. A National Park is a relatively large area where:

- (1) One or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contain a natural landscape of great beauty, and;
- (2) the highest competent authority of the country has taken steps to prevent or to eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect for ecological, geomorphological or aesthetic features which have led to its establishment, and;
- (3) visitors are allowed to enter under special conditions, for inspirational, educative, cultural and recreative purposes.

Governments are accordingly requested not to designate as "National Parks":

1. A scientific reserve which can be entered only by special permission (strict nature reserve),
2. a natural reserve managed by a private institution or a lower authority without some type of recognition and control by the highest competent authority of the country,
3. a 'special reserve' as defined in the African Convention of 1968 (fauna or flora reserve, game reserve, bird sanctuary, geological or forest reserve, etc.),
4. an inhabited and exploited area where landscape planning and measures taken for the development of tourism have led to the setting up of 'recreation areas' where industrialization and urbanization are controlled and where public outdoor recreation takes priority over the conservation of ecosystems. Areas of this description which may have been established as "National Parks" should be redesignated in due course."

This resolution was subsequently adopted by the Second World Conference on National Parks held at Yellowstone and Grand Teton National Park in 1972.

The IUCN publishes annually, in French and English, the United Nations list of National Parks and Equivalent Reserves. This lists all those areas throughout the world which have been legally declared to be National Parks and which fulfil selected, internationally accepted criteria. The term 'Equivalent Reserve' is used to denote areas which are legally protected and which meet all the criteria for National Park status but which are known by other titles, for example, Wildlife Reserve or Nature Reserve. This list was drawn up at the request of the United Nations in keeping with Resolution 713 of the 27th Session of the Economic and Social Council held in 1959 which recognised National Parks and Equivalent Reserves as important factors in the wise use of natural resources. The criteria for the inclusion in the United Nations List were approved at the 11th General Assembly of the IUCN at Banff, Canada in 1972. In brief, these criteria are protective status, effective enforcement and minimum size status.

The exploitation of any natural resources occurring in the Park must be prohibited. This means that hunting, cultivation, mining operations, cattle breeding, fisheries, lumbering, dam construction and residential operations should be banned (Harroy, 1969). Recreation is the only exploitation which, hopefully, will not make any effect if well managed.

The application of these criteria is subjective and a matter of judgement. However, it is difficult to apply all the criteria everywhere owing to the varying conditions in different countries. These criteria have been endorsed by the Jordanian Government. In late 1976 Jordan became a member state of IUCN on the establishment of Shaumari Wildlife Reserve and Azraq Waterfowl Reserve.

5-1.3 National Parks Movement in the United Kingdom

The concept of National Parks did not develop in the United Kingdom until the 20th Century. This was after a few leaders of the British Empire received information about the existence of the Yellowstone National Park in the U.S.A. Some organisations interested in nature reserves spurred the government to take the necessary measures to establish National Parks in Great Britain. As a result, the government requested a number of committees to study and investigate the possibilities of establishing National Parks in England and Wales. The Addison Committee, which was appointed in October 1929 for this purpose, published a Report (Cmd.3851) in 1931, recommending ten sites as suitable for National Parks in England and Wales.

In May, 1945 John Dower submitted a Report on National Parks in England and Wales (Cmd.6628). This Report is considered the most important and convincing document, and the logical basis of the sort of National Parks which have been established in Great Britain. These parks are subsequently referred to as "British

National Parks" although the legislation did not extend to Scotland. He defined the term National Park, insofar as it applies to Great Britain, as

"an extensive area of beautiful and relatively wild country in which - for the nation's benefit and by appropriate national decision and action - (a) the characteristic landscape beauty is strictly preserved; (b) access and facilities for public open-air enjoyment are amply provided; (c) wildlife, buildings and places of architectural and historic interest are suitably protected, while (d) established farming use is effectively maintained."

From this definition it is noticeable that Dower was willing to permit a variety of uses within National Parks. They were (a) the preservation of landscape beauty, and (b) open-air recreation for the enjoyment of the people, and (d) advocated the maintenance of the existing farming, and that his definition is basically different from that of the United States and IUCN.

Dower recommended ten areas for National Parks - those areas which had been selected by Addison.

In July 1945 a Committee, under the Chairmanship of Sir Arthur Hobhouse, was appointed:

- (a) to consider the proposals in the Report on National Parks in England and Wales (Cmd.6628) of May 1945, as to the areas which should be selected as National Parks, and to make recommendations for special requirements and appropriate boundaries of these areas which, in the opinion of the Committee, should be first selected.
- (b) to consider and report on the proposals made in the Report on measures necessary to secure the objects of

National Parks, and any additional measures which in the opinion of the Committee are necessary to secure those objects; and

- (c) to consider and make recommendations on such other matters affecting the establishment of National Parks and the conservation of wildlife that may be referred to the Committee by the Ministry.

In 1947 the Hobhouse Committee recommended 12 areas to be designated as National Parks, nine of them being areas previously selected by Addison and John Dower. Three new areas were added: the Broads, South Downs and the North York Moors.

The Dower and Hobhouse Reports are the most important documents in connection with the establishment of National Parks in Britain. Both of them pointed out that Britain's National Parks would be different from those in the U.S.A. and Africa, owing to a large population living in a small island in a highly developed country.

The National Parks and Access to Countryside Act, which was passed in 1949, confirmed the Dower and Hobhouse concept of National Parks for England and Wales. As a result a National Parks Commission was established in February 1950. The main duty of the Commission was to designate the National Parks in England and Wales for public enjoyment. By 1957 the National Parks Commission had designated ten National Parks, as shown in Table 27.

TABLE 27 : List of National Parks in England and Wales

| National Park | Date designation was confirmed | Area in acres at December 1972 | Area in donums |
|------------------------|--------------------------------|--------------------------------|----------------|
| 1. Peak District | 17 April 1951 | 346,880 | 1,404,372 |
| 2. Lake District | 9 May 1951 | 554,240 | 2,243,887 |
| 3. Snowdonia | 18 October 1951 | 540,800 | 2,189,474 |
| 4. Dartmoor | 30 October 1951 | 233,600 | 945,749 |
| 5. Pembrokeshire Coast | 29 February 1952 | 144,000 | 582,996 |
| 6. North York Moors | 28 November 1952 | 353,920 | 1,432,874 |
| 7. Yorkshire Dales | 12 October 1954 | 435,200 | 1,761,943 |
| 8. Exmoor | 19 October 1954 | 169,600 | 686,640 |
| 9. Northumberland | 6 April 1956 | 254,720 | 1,031,255 |
| 10. Brecon Beacons | 17 April 1957 | 332,160 | 1,344,777 |
| Total | | 3,365,120 | 13,623,967 |

None of the ten National Parks in England and Wales meet the criteria established by the IUCN. They contain little "natural land", are subject to economic exploitation and are not freely open to the public. Thus they are not recognised in the United Nations List of the National Parks. The National Park system in the U.K. is different from that of North America. The land within the National Parks area in the U.S.A. and Canada is owned by the Federal Governments, while the land within the area of National Parks in the U.K. is mostly privately owned. The U.K. Government exercises planning control according to the Town and Country Planning Acts dating from 1947 to 1972 which control development. The exercise of planning control is stricter in National Parks than elsewhere. Special attention is given to recreational value. In addition to that, the National Park's authorities are empowered to provide recreational facilities for the enjoyment of the countryside.

In August 1968 the Countryside Commission replaced the National Parks Commission in England and Wales. The responsibilities of this Commission are mainly (1) the conservation and enhancement of landscape beauty and amenity in England and Wales, and (2) the provision and improvement of facilities for enjoyment of the countryside, including the need to secure public access for open-air recreation.

In July 1971 a National Park Policy Review Committee was appointed under the Chairmanship of Lord Sandford to examine how far the National Parks had fulfilled the purpose for which they were established and to consider the changes in social and economic conditions which had occurred by then, and to make recommendations for future policies. Their Report was published in 1974. Some members expressed the view that certain areas should be given absolute protection by means of State ownership. As this followed the IUCN's 11th General Assembly in Banff, Canada, 1972, at which the protection of "cultural heritage areas" was proposed, they suggested that this idea should be applied to British National Parks as "National Heritage Areas" within the National Parks. These areas would be protected without development and any changes of use. Only Parliament could give permission for changes in the use of these areas. The weakness of this idea is that the English countryside owes much of its attractiveness to man's activities and, unless land use is allowed to evolve its appearance will deteriorate owing to economic forces.

The multiple-use park system, practised in the U.K., is considered unavoidable in a small-sized country with a relatively high population density. This system, unlike the U.S. National Park system, makes it possible to demarcate different zones for various uses in a single park. Thus, the system combined economic land use with conservation.

The National Park system, for example, in the U.S.A., excludes all forms of land use in favour of conservation but restricts recreation to the periphery of the National Park. The U.S. National Park system is only feasible where extensive land areas are owned by the government, while the multiple-use park system is suitable for areas where private land exists along with government land, and where there is adequate planning control.

5-2 HISTORY OF NATIONAL PARKS IN JORDAN

5-2.1 Designation of Azraq Desert National Park and Other Parks

On 26th July, 1965, His Majesty King Hussein declared the establishment of a National Conservation Programme in Jordan. After the Royal declaration, the Mountfort (1965) expedition recommended that three National Parks should be established. It awarded priority to Azraq Desert National Park centred on the Azraq Oasis. The second was to be Petra National Park and the third was to be Rift National Park. Two English experts, J. Hemsley and M. George were invited to prepare a draft management plan for the proposed

Azraq Desert National Park. Accordingly a draft management plan was prepared in 1966 for the Azraq Desert National Park covering the eastern part of Jordan to include the Azraq Oasis and the surrounding representative desert territory.

A team, consisting of experts from the United States National Park Service (USNPS), also visited Jordan in 1968 to undertake a feasibility study on the establishment of National Parks. They recommended that six National Parks be established in Jordan and gave Azraq Desert National Park the first priority. The others were Petra National Park, Wadi Rum National Park, Main Hot Spring National Park, Dibbeen National Park and Dead Sea Beach Club National Park.

5-2.2 The Purpose of National Parks in Jordan

The purpose for which National Parks, particularly Azraq Desert National Park, are being established can be stated as:

1. Conservation of natural resources (water, flora and fauna) and provision of effective protection against their extinction as well as the preservation of historical buildings and monuments.
2. The National Parks should cater for the recreational needs of the nation and earn foreign exchange for the country.
3. The establishment of the Parks should facilitate scientific research and education. This is particularly true of the Azraq Oasis, an area with the most varied and interesting plant and animal communities.

5-2.3 National Parks Draft Laws

Many people outside Jordan have taken the Royal proclamation indicating the intention to establish Azraq Desert National Park to mean that the Park had already been established by law. This is not so. A law to provide for the establishment and protection of National Parks has been under discussion since 1970. In 1975 the Ministry of Tourism and Antiquities produced a National Park Draft law for the protection of Natural Sites of Civilization and National Heritage (see appendix 2 translated from the Arabic). This draft law was rejected by parliament and so far there has not been any further progress.

5-2.4 How the National Parks have been Managed

From the beginning of the National Parks movement in Jordan a period of 13 years has passed since the proclamation of the Royal decree and still no Parks have been established in anything more than name. This is believed to be due to political unrest, especially the war in June 1967 and the events of 1970. In addition a maze of conflicting interests and different land uses in the Azraq area has contributed to this lack of progress. The Royal Society for Conservation of Nature (RSCN) was appointed under an Act (1968) to be responsible for the establishment and management of the Azraq Desert National Park. Since this date land use in the Azraq Desert National Park has been managed by three official bodies - the Ministry of Agriculture, the Ministry of Tourism and Antiquities, and the Natural Resources Authority. This is due to

the lack of qualified staff in the RSCN and the absence, to date, of National Parks Acts in Jordan. The three bodies have the following responsibilities. Firstly, the protection of flora and fauna in the Azraq area by the execution of the Agriculture Act No.(20) of 1973 (see appendix 1) through agriculture staff in the Azraq area. Secondly, the Ministry of Tourism and Antiquities is active in the areas under study (Azraq area and the other five proposed National Parks) and obviously achieves a measure of success in enforcing the laws which provide for protection of antiquities and recreational sites. Finally, the water of the pools and the boreholes are managed and protected by Natural Resources Authority staff through Acts of Parliament. Each of these bodies has its own separate objectives and terms of reference.

Today the RSCN, an authority delegated by the Minister of Agriculture to control and manage the Azraq Desert National Park, recognises that the best thing which can be achieved is a series of Reserves, each of which will protect a specific part of the Azraq area and over which practical management can be achieved. This scheme is accepted owing to many problems which have emerged in the Azraq Desert National Park.

5-2.5

An Example of IUCN Reserves in Jordan:

Shaumari Wildlife Reserve was the first Nature Reserve to be established in Jordan. In 1958 Shaumari was an Agricultural Experimental Station. The RSCN took a lease on the area. In 1975

the RSCN began to reconstruct the infrastructure. By late 1976 Shaumari Wildlife Reserve was formally established by law and it enjoys full practical protection. The Reserve is about 12 km. south of Azraq Shishan. The total area of the Reserve, about 22 sq.km. (2200 ha.), is fully demarcated. Most of the Reserve is wadi spread and the remainder is mainly limestone hammada. Shaumari Reserve is managed by the RSCN with the assistance of the World Wildlife Fund (WWF) (see Plates 7 and 8).

The purpose of Shaumari Wildlife Reserve:

The main purpose of this Reserve is to apply a conservation programme in the semi-arid steppe and to show the people what happens when an attempt is made to protect biotic communities. It is hoped to demonstrate how the desert, if properly cared for, could be productive, bring rich diversity of living things and replenish the wildlife stocks. Being thus protected the area can be developed for use as:

- (1) Breeding centre for selected species of endangered animals, and as a location in which they may be re-introduced to the wild. Such animals include the Gazelle, Ibex, Oryx and Ostrich.
- (2) A field research station for the natural history of semi-arid lands. Shaumari will offer excellent complementary facilities.
- (3) A field conservation education centre. The Reserve is already a model demonstration area showing the result of protecting the semi-arid desert from misuse. It will provide a field study area for students of different levels.



PLATE 7 :

Shaumari Wildlife Reserve: Signboard at the entrance of the animal holding unit.



PLATE 8 :

Shaumari Wildlife Reserve: The protected area (inside the barbed wire) contains plant species which are absent in the unprotected area (outside the barbed wire) as a result of grazing on the latter.

TABLE 28 : List of the proposed National Parks
in Jordan*

| National Park | Area in hectares | Area in donumes |
|---------------------------|------------------|-----------------|
| 1. Dead Sea Beach Club | 34 | 340 |
| 2. Dibbeen National Park | 600 | 6,000 |
| 3. Main Hot Spring | 100 | 1,000 |
| 4. Petra National Park | 12,200 | 122,000 |
| 5. Wadi Rum National Park | 187,500 | 1,875,000 |
| Total | 200,434 | 2,004,340 |

* National Parks proposed by the Ministry of Tourism and Antiquities

Dead Sea Beach Club, Dibbeen and Main Hot Spring lack the natural land features of National Parks but, with the addition of more land they could form portions of National Parks. Petra and Wadi Rum have a good potential for National Park status. At present there is no evidence of active conservation management in the above National Parks, and the term "National Park" is a misnomer in the IUCN sense and they cannot be considered more than recreation areas. Indeed, they are well developed for the comfort of visitors without any conservation function, under the responsibility of the Ministry of Tourism and Antiquities.

TABLE 29 : List of the Existing and Proposed
Wildlife Reserves in Jordan*

| Wildlife Reserve | Area in hectares | Area in donumes | Status |
|--|---------------------|--------------------|----------|
| 1. Shaumari Wildlife Reserve | 2,200 | 22,000 | existing |
| 2. Azraq Waterfowl Reserve | 1,400 | 14,000 | existing |
| 3. Shaumari Wildlife Reserve Extension | 17,000 | 170,000 | proposed |
| 4. Umari Wildlife Reserve | 18,000 | 180,000 | proposed |
| 5. Hazim-Qattafi Wildlife Reserve | 30,000 | 300,000 | proposed |
| 6. Rajil-Qattafi Wildlife Reserve | 80,000 | 800,000 | proposed |

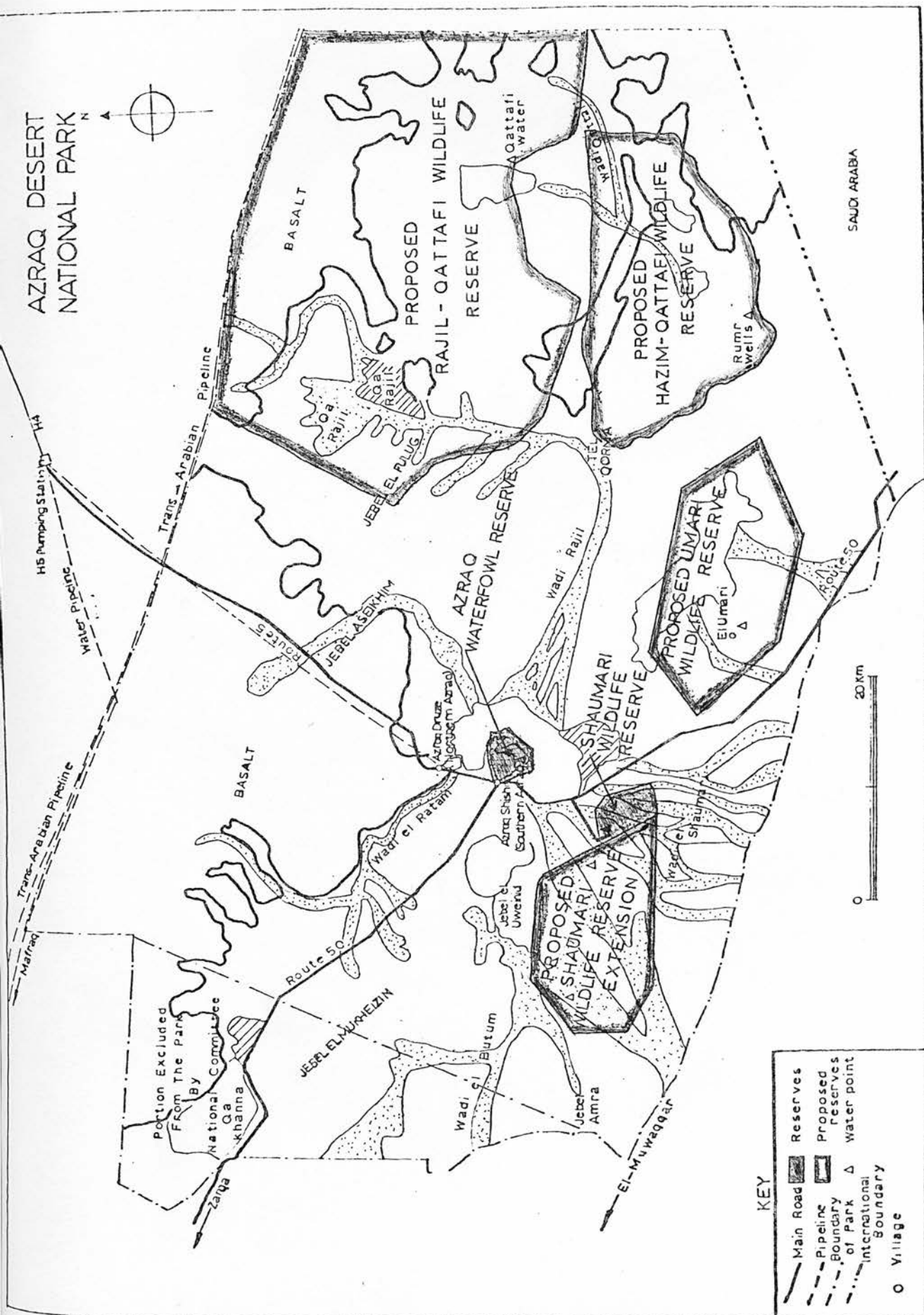
* Wildlife Reserves suggested by J. Clarke (ecologist) IUCN, WWF.

Shaumari Wildlife Reserve and Azraq Waterfowl Reserve are established Reserves. The first is located to the south of Azraq Shishan and the latter includes Shishan marshes. Shaumari extension, Umari, Hazim-Qattafi and Rajil-Qattafi Wildlife Reserves are whole proposed Reserves (see Figure 18).

5-3 PROBLEMS HINDERING THE ESTABLISHMENT OF AZRAQ DESERT NATIONAL PARK

Since the designation of the Azraq Desert National Park in 1965, several problems, especially that of nature conservation, have been encountered. The problems could be divided generally into three categories as follows:

AZRAQ DESERT NATIONAL PARK



5-3.1 Land Use Problems

There are many land use conflicts (inter-use problems) which emerged in the Park through the implementation of the Hemsley and George Azraq Desert National Park Draft Management Plan. All these land uses are not in the interest of the Azraq Desert National Park. However, an area catering for different kinds of land use could not be recognised as a National Park according to the IUCN sense, (1969). The following land uses are found within the boundary of the Azraq Desert National Park:

1. Arable Agriculture
2. Pumping water to the Northern District (Irbid)
3. Grazing by nomadic pastoralism
4. Livestock Farming
5. Construction and use of highway through Azraq Desert National Park
6. Military Use of the Azraq Desert National Park
7. Salt Extraction
8. Reed cutting
9. Fishing

5-3.2 Recreation Problems

Azraq area is already a popular place for visitors from different parts of Jordan, especially Amman and Zarqa. Such heavy pressure of visitors go to Azraq pools and the nearby Azraq National Park. The latter site differs from Azraq Desert National Park as proposed by Hemsley and George (1966). It is an area of about 600 ha. midway between Azraq Shishan and Azraq Druze. It has a large hotel, restaurant, snack-bar and hot mineral springs which are provided under the auspices of the Ministry of Tourism and Antiquities. It has no conservation function and the term "National Park" is a misnomer. The historical sites in Azraq Park (Qasr Amra, Kharana, and Qasr el Azraq) attract visitors regularly,

especially at weekends and holidays. More recently Shaumari Wildlife Reserve has tended to attract visitors during holidays, and additional pressure will be likely to occur when the Reserve is declared open to the public. Careless visitors have spoiled the area around Shishan pool by throwing litter here and there. The situation is often worsened by the western wind which blows the litter far and wide.

5-3.3 Other Problems

The management of National Parks in Jordan is also hindered by the following problems of legislation and administration.

1. Lack of specific National Parks law in Jordan.
2. Shortage of qualified and trained personnel.
3. Insufficient finance.

5-4 MAIN PROBLEMS OF LAND USE IN THE AZRAQ DESERT NATIONAL PARK

Many types of land use have been practised in the Azraq area for a long time with the full approval of the government. The Royal proclamation of 1965 has brought to the surface a conflict between the existing land uses and the interests connected with the establishment of the Azraq Desert National Park.

In the past the government realised the needs of the inhabitants living in desert and Azraq villages and granted them various rights of land uses to earn their livelihood. These rights

and privileges enjoyed by the people can not be denied and due emphasis should therefore be given to them in planning the Azraq Desert National Park. Due to the recognition of the existing land uses within the Azraq Desert National Park area it is not possible to fulfil the criteria laid down by the IUCN for the establishment of the National Parks, but the prevailing circumstances demand the maintenance of the existing land uses effectively for social, economic and political reasons.

There are many problems associated with the establishment and management of the Azraq Desert National Park for continuation of the existing land uses on one side and conservation of the area on the other side. These are:

5-4.1 Pumping Water Outside the Park to the Northern District (Irbid)

The scheme for supplying water from Druze and Shishan pools to the cities and towns in the Northern District of Jordan, particularly the town of Irbid, was undertaken in 1963. This water is absolutely necessary for domestic consumption. According to the survey conducted to determine the water requirement for the Northern District, it appears that the demand has increased many times, particularly after the migration of people from the neighbouring countries following the disturbances caused by the 1967 war. There is no other source to meet the increasing demand for water and as a result more water is expected to be pumped out of this deep aquifer. The continued pumping of water, even for agricultural purposes, from the same source resulted in lowering the water table affecting the entire ecosystem. The adverse effect of pumping may

cause the encroachment of saline water from the adjoining Qa el Azraq. This affects both flora and fauna inhabiting the marshy areas. With the increasing salinity there is every possibility that the diversity in the plant and animal community may be seriously affected. Another possible adverse effect is the contamination of the potable water of Azraq springs. The government considered this pumping scheme as a most successful project, but its viability depends upon the rate of abstraction being consistent with the rate of natural replenishment.



PLATE 9 :

Azraq Druze Water Pumping Station: pipeline conveying water to the Northern District (Irbid).

5-4.2 Arable Agriculture

A significant area has been developed for the production of agricultural crops as well as cash crops by irrigation. The best quality land is dedicated to agriculture occupying an area of 1,312 ha. located towards the south and east of Azraq Druze. Agriculture is made possible by irrigation from artesian wells. There is a conflict between irrigated agriculture and the water resources in the Azraq area. The digging of artesian wells for irrigation is likely to affect the water table of the shallow aquifer. This will exert an influence upon the deep aquifer so far as natural replenishment is concerned. There are sporadic cases of mechanized cultivation for the production of wheat and barley immediately after rains in the south-western part of the Park near Qasr Amra. The growing tendency for expansion of arable agriculture will affect the site of the Azraq Desert National Park and this necessitates the control of arable agriculture consonant with the objectives of the management of the National Park.

5-4.3 Grazing

Grazing and browsing by sheep, camel, donkeys and goats of nomadic Bedouin have been taking place throughout the year in the Azraq Desert National Park. Grazing depends on the favourable condition of season, rainfall and availability of grazing opportunities in the neighbouring countries like Iraq, Syria and Saudi Arabia. The Bedouin families are mobile throughout the vast tract of arid zone (Azraq Desert National Park). Grazing occurs en route by big herds during the movement from their summer encampment in



PLATE 10 :

Azraq Druze Village: A typical irrigated farm land to the east of Azraq Druze village. The crops shown here are summer crops.

Jordan and Syria to their winter encampment in Iraq and Saudi Arabia through the Azraq Desert National Park. This affects badly the vegetation and the water resources of the Park. Large herds of animals get an opportunity of grazing around the camp of temporary halt, usually near the desert watering points or the springs of Azraq (see Plates 11 and 12). Encampment near a water point facilitates the drinking of the grazing animals. Some families possess vehicles and use these to supply water by drums. Then their encampment takes place also on the site most suitable for grazing.



PLATE 11 :

Lion Spring: Goats grazing around the Lion Spring to the south-west of Azraq Shishan - within the boundary of the Azraq Desert National Park



PLATE 12 :

Wadi el Shaumari: Camels grazing the palatable species such as Atriplex halimus across the fence. The animals neglect the unpalatable species such as Peganum harmala outside the protected area.

5-4.4 Military Use

The Park area used for military purposes poses many problems. Military uses include training, battle exercises, use of firearms, movement of heavy equipment and the low flight of aircraft over the Park area. This causes damage to the interests of the Park particularly so far as fauna are concerned. Wild animals are frightened by the military activities and sometimes the habitat is damaged. Many animals become extinct due to abuse by human activities in the past. Now plans are underway to reintroduce wild animals to Shaumari Wildlife Reserve which is part of the Azraq Desert National Park. The proposed stock contains noise sensitive species like Gazelle and Arabian Oryx and such animals are likely to be frightened by the noise of low-flying military aircraft. This will affect their living and breeding. The use of the Azraq area for military purposes, whether on ground or in the air, is incompatible with the objectives of nature conservation.

5-4.5 Heavy Traffic

A heavy flow of traffic on the new highways (Routes 50 and 5) passes through the Azraq Desert National Park to Saudi Arabia and H.5 (see Plate 13). The majority of the vehicles plying these roads are commercial lorries loaded with heavy goods. Azraq Desert National Park has become a crossroad linking all the neighbouring Arab countries, namely Syria, Iraq and Saudi Arabia. This heavy traffic upsets the ecosystem of the Park by frightening

and disturbing wild animals and might force them to emigrate from the Park. Moreover the exhaust gas which the engines of the large vehicles emit might create air pollution. Over a long period this may have a bad effect on the flora and fauna of the Park. The highway attracts many visitors from different parts of Jordan and so will attract heavy pressure from visitors and recreationists on the Park. Forster (1972) advises that the major highways or through-roads should never be built within or to the edges of core areas of the National Park, if the Park is to be left undisturbed, and that they should always be limited to outer zones.



PLATE 13 :

Azraq highway (Routes 50 and 5) : Heavy traffic flow occurs inside the Azraq Desert National Park. Plate shows vehicle with trailer going to Saudi Arabia through Route 50.

5-4.6 Recreation

Azraq Oasis attracts a large number of visitors from different parts of the country. The presence of highways makes it easy to reach Azraq quickly. Also the "Azraq National Park" (recreation site, see Plates 14, 15 and 16) attracts visitors due to the availability of tourist facilities on this site. Moreover, Azraq antiquity sites attract Jordanian visitors regularly, as well as foreign visitors. Azraq pools are physically and biologically affected by the visitors. Among the physical changes are:

(a) Most of the visitors are concentrated in the immediate vicinity of the Shishan pools, and damage is consequently caused by the parking of their vehicles around the margins of the pools.

(b) The accumulation of litter around the Shishan pools, and scattered by the westerly wind, gives an ugly appearance to the area (see Plate 17). The biological changes means the elimination of some plant species by recreationists, and may also frighten away wildlife and birds.



PLATE 14 :

Signboard at the entrance of a recreation site which points the way to the new hotel beside the Azraq hot mineral spring. The use of the term "National Park" here is misleading.



PLATE 15 :

The first stage of the new hotel, restaurant, and the large parking area inside the recreation area called the "Azraq National Park".



PLATE 16 :

The hot mineral spring inside the recreation area - "Azraq National Park". Background shows typical plantation of Tamarix jordanis and Pinus spp.



PLATE 17 :

Azraq Shishan pool: The uncontrolled grazing in the Shishan pool, especially by water buffaloes Bubalus bubalus in the foreground, could be seen on the bank of the pool. Empty cans left by visitors and papers scattered by the prevailing westerly wind.

5-4.7 Hunting and Shooting

Illegal hunting is of frequent occurrence in the Azraq Park. This is done by the desert Bedouin, local villagers of Azraq Druze and Shishan, and by visitors from outside. The government has authorised the Royal Society for Conservation of Nature (RSCN) to regulate hunting in the Azraq Desert National Park.

According to the existing rule two days a week (Sunday and Friday) are allowed for shooting during open season. The open season for shooting starts from 1st October and closes at 31st March. Hunting is allowed only in wetland areas and within 1 km. of its margins. Only those birds listed on the hunting schedule should be shot. In spite of the legal control of shooting and hunting by the RSCN, laws are broken frequently. Gunshot may often be heard during the closed season. This is due to many reasons:

(a) There is no strict observation on illegal hunting by the RSCN owing to the shortage of staff and facilities.

(b) Hunters cross the border from Saudi Arabia to hunt in the Azraq Park.

5-4.8 Salt Industry

Salt industry plays an important role in the local economy. Most of the families in Azraq villages earn their livelihood by salt extraction (see Plates 18 and 19).



PLATE 18 :

Salt extraction site showing the brine well and the pumping plant. Notice pans division and the Azraq Druze village in the background.



PLATE 19 :

Pans through which extracted brine passes.

The salt production is gradually increased, particularly after the formation of Azraq Co-operative Society in 1975. Salt production has increased from 85,714 sacks in 1965 to 140,000 sacks in 1976 (each sack containing 140 kg.) (Clarke, 1977). This unprecedented rise in salt production during the last decade, and future increase, may affect the site and depletion of resources.

5-4.9 Administration of the Azraq Desert National Park

The administration of the Azraq Desert National Park is extremely poor for various reasons. These are:

5-4.9.1 National Park legislation

This is essential in managing the Park area. Without National Park law the Azraq Desert National Park has no legal coverage to deal with any matters from the viewpoint of legal consideration. No National Parks legislation has yet been formulated and approved by the highest competent authority of the country. In the near future National Park legislation for the Azraq Desert National Park is expected to be enforced specifying the privileges and rights which will be exercised by the people in addition to activities prohibited within the Park area. This should ensure conservation and wise use of the resources, taking into consideration the ecological and economic characteristics of the whole complex.

5-4.9.2 Shortage of Staff

National Park management is a highly technical job. In order to run the administration and execution of the development

works, management, and perpetuation, a cadre of service is essential. However, there are no training facilities in Jordan for Park management. Presently the Park is being managed on the basis of experience gathered by some personnel through touring and conferences in foreign countries.

The management body of the Azraq Desert National Park and the Shaumari Wildlife Reserve consists of a director, a foreign expert, two inspectors and two game wardens. This staff is inadequate for scientific management purposes.

5-4.9.3 Finance

The financial resources of the Azraq Desert National Park and Shaumari Wildlife Reserve are very limited. Revenue depends mainly on the income from the membership fees paid to the Royal Society of Conservation of Nature. This source of finance is at present negligible and not sufficient to meet the obligatory expenditure. The other sources of the finance are the grants from the Jordanian Government, international organisations such as UNESCO and UNEP, and private organisations such as IUCN and WWF.

PART 6

P R O P O S A L S

PART 6 :

P R O P O S A L S

6-1 OBJECTIVES OF CURRENT LAND USE

The main stated and implied objectives of land use management in the Azraq Desert National Park are placed in order of significance as follows:

The stated objectives are:

1. To conserve the natural resources of the Azraq Desert National Park, such as the natural features of flora and fauna of the Park, and other resources.
2. To provide the opportunity for public recreation in the areas of high scenic attraction and antiquities for the enjoyment of the public.
3. To encourage research and scientific studies.

The implied objectives inherent in the present use pattern are:

1. Supply the Northern District (Irbid) with water for domestic use.
2. Settlement and agriculture crops within the Park.
3. Grazing by the nomads within the Park boundary.
4. Ensure military security in the area.
5. Efficient communication within the Park boundary.
6. Hunting and shooting within the area of the Park.
7. Economic production of salt industry in the Azraq area.

The purpose of this section is to examine the 1966 draft management plan of Hemsley and George, in relation to the current land use problems in the Azraq Park. The suitability of different kinds of administration, such as the IUCN National Park type, Multiple-Use type (U.K.), and separate Nature Reserves according to IUCN criteria, excluding areas with other land uses, is also considered.

Hemsley and George state that the ^{overall} objective in establishing the Azraq Desert National Park is to demonstrate the way in which the natural features and the resources of Azraq area can, by wise land use management, be utilized in the best national interest. This ^{overall} object of management is divided into the following primary objectives:

1. To achieve a balance in land use economy so as to obtain a natural replenishment of Azraq resources.
2. To protect, preserve and, where necessary improve, the scenic attraction, wildlife stock, antiquities and other features of desert environment.
3. To promote increased tourism in the Park by providing better road communications, recreational facilities and accommodation.
4. To provide within the Park the facilities required for scientific studies.

Management and Research Programme

This programme is divided into three main parts:

1. Estate Works:

These include the definition of the Park boundary, building roads and track improvement works, building of Park reception offices with suitable accommodation for permanent staff and Park headquarters building, fencing work, construction and erection of signboards. Most of this work has not been done.

2. Conservation Management Programme:

Most of this programme consists of an urgent need for positive action to arrest the processes of regression and further degradation of the environment and its remaining natural resources. The programme considers the steps to be taken to conserve wildlife and the vegetation within the Park. Although Hemsley and George suggest that hunting and shooting could be allowed in the Park, they have suggested an immediate conservation programme to conserve the wildlife in the Park. This programme involves a complete ban on killing of Gazelle and Houbara bustard at all times, the prohibition of hunting from moving vehicles and automatic weapons, and finally the introduction of gun licensing policy. Under the conservation of the flora of the Park they have recommended a complete ban of motor vehicles - tankers - trailers for carrying water from the pools to supply domestic stock in the remote areas of the Park.

The long-term programme devises a solution for grazing by the nomads in the Azraq Park. This solution is to establish settled holding units. The nomadic Bedouins refused this solution steadily because it is not in tune with their traditions. In the alternative proposals Hemsley and George suggested establishing within the Park a series of zones in which grazing could be curtailed for two years' period, and to include within these areas a series of fenced enclosures where grazing would be totally prohibited for experimental and demonstration purposes. They have failed to give an immediate solution for the grazing problem, such as the control of grazing in specific areas under strict supervision by regular patrols. They also advised against the provision of further desert watering points or anything which could stimulate increasingly destructive use of the Park. Hemsley and George have suggested contour furrowing, and surface mulching, or the use of other techniques for reducing surface moisture loss. They have failed to discuss the effect of a pumping water scheme to the Northern District (Irbid) and its influence on Azraq pools. The flow to Irbid had increased from 4200 m³/day in 1966 to 7200 m³/day in July 1977. Moreover, the Azraq pumping scheme was implemented in 1963 by pumping water to Irbid for domestic consumption at a rate of 3600 m³/day.

Research Programme

This programme includes three categories:

1. Programmed work, which includes experimental and investigational projects on problems of direct application to the conservation and management of the Park. Important examples are range management studies which will involve the investigation of grazing and browsing pressure and their effect on vegetation, and the experimental work covering the restoration of vegetation cover and the reinstatement of larger woody species, e.g. Pistacia atlantica. Also important is the restoration of populations of animals and birds species in need of protection, e.g. Gazelle and Houbara bustard. Also they have suggested a programme of species re-introduction to restore the population of Gazelle and Ostrich which were native in the Park but were killed out many years ago.

2. Programmed studies of a wider nature:

This involves ecological, and hydrological, investigations. These include studies on hydrology of the Park area, including measurement of rainfall, run-off water, evapotranspiration from the marshlands, characteristics of spring flows and wells, as well as water quantity and quality. These studies are aimed at conserving the water resources and water balance aspects of the Park's hydrological regime.

3. Un-programmed Work :

This includes studies which will be carried out in the Park by those visiting experts of the I.B.P .

On road communication the management plan has offered good recommendations for improving some of the existing tracks, either as main Park routes, or as part of an ancillary loop system. They added that this idea may introduce a greater volume of traffic to a small proportion of the Park. At present the access to the

Azraq Park is still via four routes. Three of them (Routes 50 and 5 from the three) have now been asphalted. As a result of this road development Azraq has become a major crossroad in the Middle East.

Military use is not so marked as it seems to have been in 1966. Training exercises appear to be restricted to the western part of the Park. A military airbase has been established in the Park area.

On recreation the management plan noted that there was little evidence of university or school interest in the Azraq area. Today there are occasional groups who visit from the university, but school parties are more common. The use of Azraq pools has increased greatly owing to the easy access by the asphalt road from Amman and Zarqa. Summer and spring Fridays and holidays witness a considerable influx of visitors. Signs of heavy public usage are mainly to be found in the immediate vicinity of Azraq Shishan pools. In addition to the effect of heavy and private cars which have been driven to the pools margins, the visitors also leave their litter in this area.

Hemsley and George did not make any suggestions in connection with salt extraction in the Park area. Today a licence system has been introduced to replace the old system of salt tax.

The management plan has failed to mention anything about the need of a National Park law in Jordan. They proposed that Park regulations should be drafted, approved and ready for implementation by May 1967. The management plan cannot be successfully executed without protection and conservation measures. The National Park law is expected to regulate the relations between the intentions of the government and the duties and rights of the people. As no National Park law has yet been passed in Jordan, no area now has the legal status of a National Park.

Hemsley and George also stated that the control and enforcement of Park regulations should be effected by a Park staff supported by the present complement of Desert police. They suggested that the staff of the Park should comprise a Park director, one chief ranger, five rangers and gatekeeper staff in the reception offices, in order to facilitate detailed and up-to-date knowledge of events in the Park. They called for additional temporary seasonal rangers between June/April, the peak months for visitors.

A small number of Land Rovers, or equivalent vehicles (possible five) should, according to Hemsley and George, be attached to the Park headquarters. They also suggested that fees should be paid by all car owners driving into the Park. This is for the use of well-surfaced roads. The money collected, in addition to the government vote for the Park, could be used in running the Park.

CONCLUSION

The Hemsley and George Draft Management Plan of 1966 does not provide for a National Park in accordance with the internationally accepted criteria. When the management plan was written in 1966, the IUCN had not issued standard criteria for National Parks. It seems that Hemsley and George were thinking of National Parks in the sense that they are known in the United Kingdom rather than the stricter contexts of the U.S.A., Canada or eastern and southern Africa. However, an area catering for different forms of land use could not be a National Park in the sense recognised by the IUCN (since 1969).

Although the draft plan did not provide for setting up a National Park in keeping with the IUCN criteria, it did provide for a much-needed programme of conservation and land use. The implementation of such a programme would be a step towards the evaluation of the resources of the chosen site and establishment of a National Park. However, owing to the legislation and administration problems identified earlier, this plan has not been implemented because it does not take into account the real needs of the people in the area and in Jordan.

There are three possibilities for the future management of the area known as the Azraq Desert National Park:

6-2.1 IUCN National Parks

The IUCN National Park Commission laid down in 1967 three criteria for designating an area as a National Park and Equivalent

Reserve. The three criteria were legal protection, specified minimum size, and the enforcement of relevant National Parks laws. On the basis of these the ICNP published, in 1967, the names of qualified National Parks in the United Nations List of National Parks and Equivalent Reserves. However, these criteria were difficult to apply everywhere in the world, especially the first criterion concerning protective status. This must stem from the highest competent authority to provide strict safeguards to achieve the objectives of the Park.

According to the IUCN, the land of the National Park should belong to the government of the country, so as to protect the area from various damages. The area under Azraq Desert National Park is a mixture of government land and private land, thus the protection is difficult for want of a National Park Act. As a result the Azraq Desert National Park does not fulfil this criterion of the IUCN.

The second criterion, zonation, is based on the objective and each zone should be of a minimum reasonable area (1000 ha.) in order to achieve the objective. The administrative buildings and other tourist facilities are usually located outside the zone area to make the area free from interference by other uses.

The third criterion, the effective enforcement of legislation and execution of the provision of the management plan, depends entirely upon the performance of the staff. The execution

of development works is largely dependent on the finance. Both the inadequate staff and stringency in the budget are stumbling blocks to the implementation of the various development works in Azraq Park.

Harroy (1969) stated that those activities which are not considered to conform with the objective should be excluded from National Parks and Equivalent Reserves. These are: cultivation, cattle breeding, hunting, fishing, lumbering, mining operations, and dam construction. The activities which normally should be barred from the Park area are: residential developments, commercial or industrial enterprises and the building of roads, railroads, aerodromes, ports, power lines and telephone lines. Most of these activities are, in fact, present in the Azraq Desert National Park.

CONCLUSION

Azraq Desert National Park is providing facilities for various land uses such as irrigated agriculture, livestock farming, grazing, salt extraction, pumping water outside the Park, construction of major highway, military use, legalised hunting, and residential development. All these land uses, occupation and exploitation, are not in conformity with the definition of a National Park which was approved by the 10th General Assembly of the IUCN (1969), and also does not conform with the three criteria spelled out by the IUCN for inclusion in the UN list which was approved by the 11th General Assembly of the IUCN (1972).

It is not possible to exclude the existing land uses from the proposed Park area for social, economic and political reasons. The privileges and the facilities have been enjoyed by the people in connection with land uses for a long period and any change will have serious repercussions in the area, so it can be concluded that it is impossible to manage the whole of the presently defined Azraq Desert National Park according to the criteria laid down by the IUCN.

6-2.2 Multiple-Use National Parks

Multiple-Use Park management seeks to provide all the facilities. Taking into account the existing land uses on economic and social grounds, the overall management plan seeks to obtain the following purposes:

- (a) To conserve the area proposed for a National Park.
- (b) To protect the area proposed for a National Park.
- (c) To provide recreational facilities within the proposed Park.
- (d) To encourage scientific research.
- (e) To maintain effectively the existing land uses.

Hemsley and George suggested in their draft management plan for the Azraq Desert National Park, 1966, a Multiple-Use National Park. The main objectives outlined by Hemsley and George were, conservation, protection, encouragement of tourism and scientific studies in the Azraq area, and that the resources will

be utilized in the greatest interest of the nation. It is, however, primarily a plan for nature conservation and recreation and insufficient attention is paid to the benefits and needs of the economically productive systems of the area. The proposed Azraq Desert National Park in Jordan bears similarity with the National Parks system in Britain. There are many land uses to be effectively maintained. In the U.K. the existing land uses are regulated by a system of development control and economic incentives. Such regulatory action is absent in Jordan. There is no National Park law in Jordan, it is therefore not possible to control land use in the Park area for want of legal coverage and the situation is made even worse by inadequate staffing and finance.

CONCLUSION

The management of Azraq Desert National Park under multiple-use is a complicated system and management needs sufficient funds and trained personnel for effective execution of various works. This type could not be applied for the Azraq Desert National Park due to the vastness of the Park, containing various land uses, lack of effective protection, absence of comprehensive management plan for overall development of the area, shortage of qualified staff and insufficient budget provision.

6-2.3 Establishment of Separate Nature Reserves According to IUCN Criteria, Excluding Areas with Other Land Uses

The problems associated with the establishment of the Azraq Desert National Park have already been discussed in detail.

These problems, particularly the conflicts of existing land uses around Azraq pools, calls for separate treatment and segregation from the rest of the area so that arable agriculture, salt extraction and military use can be effectively maintained with the excluded areas. This would provide an opportunity to exert some control over the arable agriculture and other activities which are in conflict with conservation and recreation by separating these interests spatially. The remaining areas ^{should be} demarcated into various zones according to the objectives of the National Park. Allocation of areas into different zones is based on the identification and evaluation of the resources available in the area to meet the specific requirements of the different interests.

CONCLUSION

Azraq Desert National Park represents a combination of elements of an IUCN type Park and a Multiple-Use Park. In view of the difficulties associated with staff and funds it would be better to have more specific control over small areas. Such a concentration of the management input would assist in the proper execution of the various development works, minimization of conflicts, and facilitate administration. Segregation of uses in the Azraq Desert National Park is essential to achieve long-term objectives and perpetuation of various treatments.

The supply of surface water imposes limitations on most of the land uses of the Park.

The Northern District (Irbid) depends mainly on pumped water from the Park for their domestic use. As the population continues to grow the demand for water would increase. Continued pumping of water from the Park to meet the increasing demand would lead to lowering the water table. As a result the vegetation would be badly affected. It may also lead to the contamination of potable water by the surrounding saline water. The probable solution would be to explore other sources of water supply, such as the King Talal Dam project in the Northern District, to replace or to supplement that from the Azraq Desert National Park. The recycling of sewage water for certain kinds of use is another possibility. This could be used for industrial and agricultural purposes. It is also necessary to determine the current domestic water needs and to project this against the probable population increase. Moreover an economic water policy should be applied to the Northern District. This will enable the authorities to determine which of these actions to take.

Since nomadism is an established way of life of the Bedouins, the immediate solution to the problem of overgrazing could be by restricting the Bedouins and their cattle to specific zones, such as in the open areas lying between the proposed Nature Reserves.

This may completely remove the vegetation and cause accelerated erosion. The situation might exert a repercussive effect on the adjoining Reserves. This will cause catastrophe on the economy of the Bedouin. A vigilant patrol should be maintained to monitor grazing in the Park area depending on the carrying capacity to sustain the pressure of the animals. This necessitates restriction on grazing either by curtailing the number of animals or reducing the period of grazing in the specified area. The introduction of the deferred and rotational grazing system may not be applied in the arid region (Azraq Desert National Park) because the plants do not recover rapidly in that area of the desert. Grazing is highly dependent upon the availability of water and vegetation. The intensity of grazing is increased with the digging of new wells. In order to have a strict control over grazing it is necessary to impose restrictions on the construction of new wells in the area.

A long term solution of the grazing problem is to change the philosophy of life by making an alteration in the way of life amongst the Bedouin. This might be achieved by imparting proper education to the younger generation. The nomadic way of life does not offer any more than a basic subsistence and this necessitates a change in the whole system. The older generation, habituated with the system since time immemorial, may not respond to the need of the new way of life, rather social repercussion may be visualized as the large herd of grazing animals is the symbol of social prestige and dignity. In order to bring about a change in the

social fabric permanent cultivation is to be introduced by drawing up long term projects. Such projects should provide facilities for education, training, improved methods of grazing, credit and marketing facilities for the products. The young nomadic people may be educated by mobile education units, preferably around the desert watering points, with the aid of cinema, T.V., and other educative features. This will create consciousness for the better way of life, amongst the younger generation, in permanent agriculture. The process of evolution from nomadic pastoralism to a sedentary cultivation is a delicate one and much depends upon the ability of the staff charged with this responsibility. Properly trained staff are needed to handle this issue effectively.

In order to practise agriculture efficiently and to increase production in arable agriculture the present agricultural area should be zoned and put under scientific management by the Ministry of Agriculture. No further extension to this area should be granted. Farmers should not be issued licences to dig more than a specified number of artesian wells for their crops so as to keep the water level in the shallow aquifers stable. At the same time shifting agriculture should be avoided outside the boundaries of the agricultural area.

Although military use conflicts with nature conservation in the Azraq Desert National Park, national security has to be given top priority. It is, therefore, not logical to eradicate this use

from the Park area. The best solution is to confine military use to the present area without further extension. The noise made by aircraft affects wildlife psychologically. In order to reduce the effects of this disturbance it is suggested that, by good communications with the Ministry of Defence, a limit should be placed on the altitude of flights over Nature Reserve areas.

Heavy vehicular traffic passing through the area causes serious environmental pollution. In order to reduce the effects of this disturbance within the Park no further major highways should be constructed within the central area of the Park.

Tourists should not be allowed to enter into the Park area and around Shishan pool margins with engine driven vehicles, but may enjoy going through the tract on foot. Car park facilities should be established close to Shishan pool for the tourists' vehicles. This measure is considered necessary to preserve the pools area from further damage. There is a provision for car parking in the "Azraq National Park" recreation site, and visitors can leave their cars behind whilst entering the Nature Reserves by special vehicles owned by the National Park authority for recreation. An efficient system of litter disposal throughout the Park is necessary, especially in the recreation areas. Public conveniences should also be available in the recreation areas.

The number of visitors must not be allowed to go beyond the carrying capacity of the site. The carrying capacity may be

looked upon as a physical, ecological and perpetual aspect of the area.

Hunting is a serious problem to the animal population and over-killing may completely reduce the stock. Regulated shooting, as organized by the RSCN, may bring about a good result. In order to preserve the animal population mobilization of public opinion is of paramount importance. This can best be done by propaganda through the media of the national broadcasting system. In addition a strict vigilance must be maintained by the law enforcing agencies to prevent poaching and unauthorized shooting.

Salt production by the inhabitants plays a significant role in the local economy and as such this can not be abolished. The harmful effect of salt manufacture can be reduced by regulating the system without further extension and limiting the issue of licences.

The formulation of legislation and enforcement of same can ensure better protection for flora and fauna and this must be proclaimed as early as possible. Trained staff are essential to carry out the provisions of the management plan, and necessary steps should be taken to impart training to staff. If the creation of facilities for training staff within Jordan is not possible at present then staff may be sent abroad for training where such facilities are available.

It is proposed that the Azraq Desert National Park should be a combination of the IUCN-type Park and Multiple-Use Park to achieve the objectives effectively.

The existing land uses, such as pumping water, arable agriculture, military activities, livestock farming, fishing, hunting and recreation, are mostly confined to the central part of the Park around the Oasis (pools). In order to regulate and control the existing land uses, preservation of the resources, development and management of the Park, the following strategies are spelt out to obtain the objectives:

6-4.1 Water Supply

Pumping water, and excessive withdrawal of water to supply Irbid and the adjoining areas in the Northern District, may cause a reduction in the water table and subsequent encroachment of saline water from the neighbouring areas, making the water unsuitable for consumption. Pumping water is to be regulated in such a way that sustained yield of water can be ensured in perpetuity by a balance between abstraction and natural replenishment. If the demand for water exceeds the natural capacity of replenishment of existing pools, other sources of water must be explored to meet the growing demand. Another possibility is the establishment of a reservoir in Irbid to supply the area with water during the peak demand in summer. The recovery of water from sewage has a bright

prospect to increase the water quantity to be used for various purposes, but due to a religious belief this water cannot be used for domestic purposes. This necessitates finding a new source of water for domestic purposes, such as the King Talal Dam project. The responsibility for pumping water to Irbid and the adjoining areas lies with the Natural Resources Authority (NRA).

6-4.2 Grazing

The life of the people, particularly the nomadic Bedouin, is tied with grazing. The economic prosperity depends upon effective maintenance of the existing grazing on scientific lines. It is not possible to eradicate the system evolved through the centuries. Every attempt should be made to educate the mobile population for sedentary cultivation. This would not only assure a better way of life but would also be a step towards conservation of the resources. The problem is a delicate one due to social and economic factors and this requires a special programme for its solution. The Ministry of Agriculture (Range Department) should carry out experiments to determine the carrying capacity of the area, and improvement of pasture and livestock breeding. In addition the Ministry of Education, in close collaboration with the Ministry of Agriculture, should organize mobile schools and other media of instruction to educate the nomadic Bedouin so that a better way of life can be provided and accepted by them.

6-4.3 Arable Agriculture

The area under arable agriculture (south and east of Azraq Druze) is to be demarcated and separated from the rest of the area. Under no circumstances will agricultural extension or construction of wells be allowed in the area. The Ministry of Agriculture may be in charge with the responsibility of regulating arable agriculture, and measures may be adopted to enhance the productivity within specified areas on economic grounds. Shifting agriculture will not be allowed outside this zone.

6-4.4 Military Use

Military use is usually given top priority from the viewpoint of national security. Further intensification may come in conflict with the interests of the Park. Military activities should be confined within well demarcated areas and no further extension should be allowed.

6-4.5 Salt Extraction

For salt extraction there is no policy of the government relating to the level of production which will be allowed annually. It is necessary to formulate a salt policy depending upon the demand and resources available in the site. A comprehensive plan may be drawn up to extract salt as effectively as possible without impairment of the quality of the resources. The Natural Resources Authority (NRA) may be charged with the responsibility of regulating the salt industry and control, by the restricted issuing of licences, may be necessary in the greater interest of the nation. The area

under salt extraction should not be allowed to expand further. The NRA should determine the most suitable sites for salt extraction.

6-4.6 Recreation

Recreation is concerned with three types of management, such as overall management, enterprise management and site management.

Overall management is concerned with the management of the whole recreational sites in the area. The area outside the "Azraq National Park" is under the Ministry of Agriculture. There is a proposal from the RSCN to declare Reserves to the south and east of Routes 50 and 5 and make over position for management by the RSCN, in addition to Shaumari Wildlife Reserve and Azraq Waterfowl Reserve. The RSCN has planned to allow visitation in these Reserves.

The Ministry of Tourism and Antiquities have constructed an hotel, restaurant, swimming pool and snack-bars, and other facilities, to cater for the need of the tourist. The Ministry of Tourism and Antiquities may be interested in the running of tourist enterprises more effectively and providing more facilities for the visitors.

The management of the site is a highly technical job and a separate Park service is essential to manage the site efficiently. Conservation of resources on the sites depends upon the skill of the staff responsible for interpretation. Interpretation is necessary for visitors use, control of visitors, diversion of visitors from the more fragile areas, and enhancement of the visitors enjoyment of the Park by the setting up of facilities such as an Information Centre, maps, leaflets, notice-board, posters, and other suitable displays. Tourists may be provided with guides to facilitate their understanding of the area more intimately so that least damage is made by the visitors use.

6-4.7 Heavy Traffic

The Park area is traversed by highways. Further opening up of the area with the construction of highways may jeopardize the object of the Park. If new roads are needed they should be constructed on the periphery. Heavy traffic should be restricted as far as possible. The maintenance of these highways should be under the control of the Ministry of Public Works.

6-4.8 Shooting and Hunting

Shooting and hunting should be under the strict surveillance of the RSCN. These activities should be regulated by law. Illegal shooting should be prevented by strict patrols and by inflicting heavy penalties for violation of the laws.

The most westerly triangle of the old proposed Azraq Desert National Park has already been excluded from further consideration by the National Park Committee (see Figure 19).

For better administration and control of the Azraq Desert National Park it is necessary to segregate the various land uses - such as arable agriculture, military use, antiquity sites, pools, salt extraction, settlement and recreation, and Nature Conservation areas, into separate zones.

The Ministry of Agriculture is charged with the responsibility for the effective maintenance and improvement of the existing arable agriculture in Zone (A) (see Figure 19); the Ministry of Defence is responsible for the uses of areas within the National Park in such a way that will cause least damage to other interests; the Ministry of Tourism and Antiquities is charged with the responsibility to manage the recreational and historical sites in Zones (S) and (t), tourist facilities, and further improvement according to desire of the tourist industries; the regional director is responsible for handling settlement and other civil affairs in Zone (S); the Royal Society for Conservation of Nature is responsible for the effective control of hunting and management of the proposed Nature Reserves in Zones (R); the Range Department under the Ministry of Agriculture will be wholly responsible for the effective control and management of grazing in the Park area; the Natural Resources Authority is charged with the responsibility to manage the salt

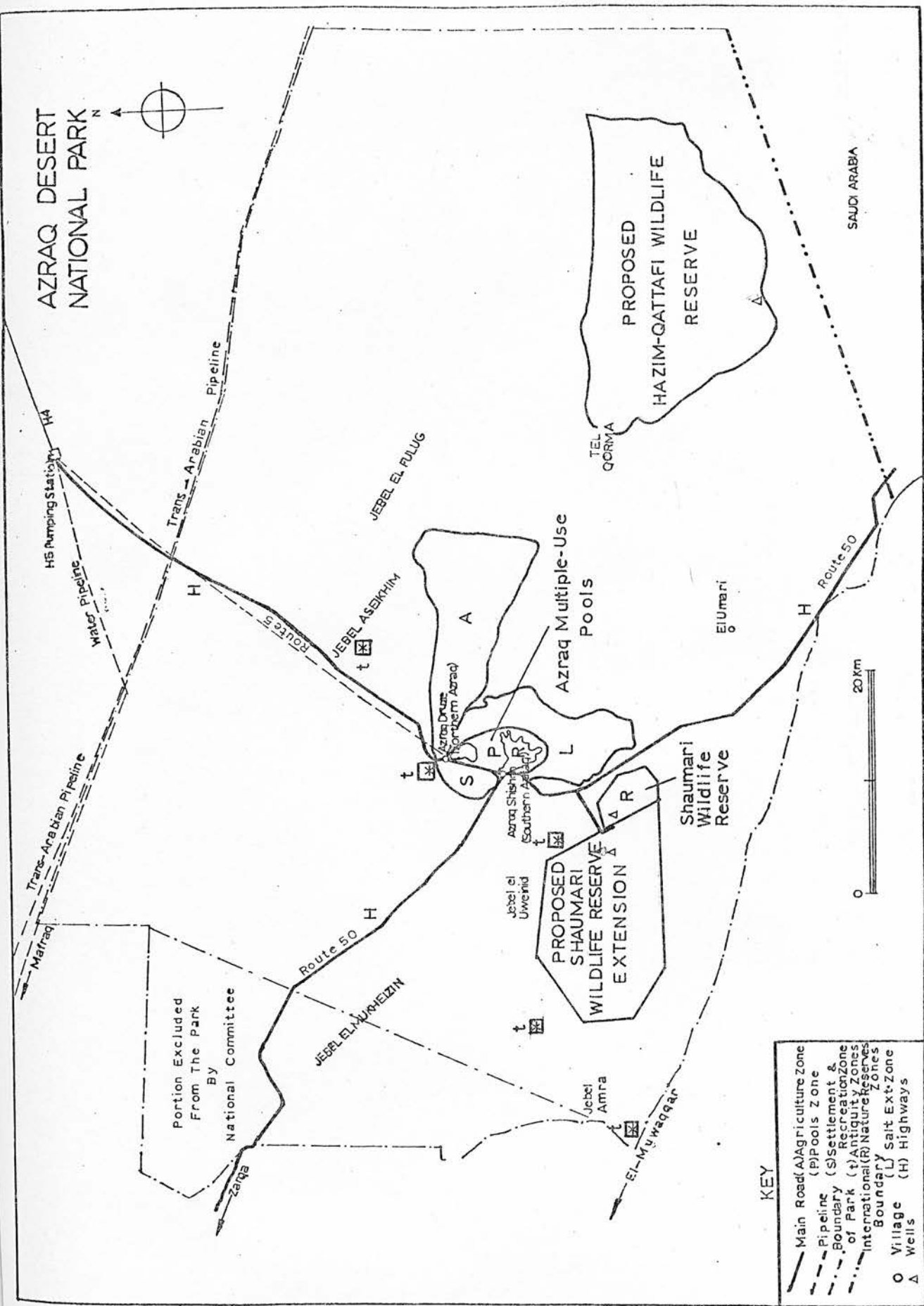


FIGURE 19 : The Proposed Zonation of Azraq Desert National Park (after Clarke, 1977)

industry and water resources in Zones (P) and (L); the Ministry of Public Works is charged with the responsibility of the effective maintenance of the highways for efficient communication (H); and one representative from the Bedouin tribes is necessary to ensure the demands of the Bedouin in the area.

The pools of Azraq Druze and Shishan are essential for the perpetuation of various uses, such as amenity for recreation, an ideal place for nature conservation, pumping water for domestic purposes, hunting area in open season and livestock grazing of the neighbouring villages. The special features associated with the pool necessitates its management as a multiple-use area.

In order to utilize the pool resources more effectively in perpetuity and to minimize the conflicts likely to appear during use, it is proposed to administer the pool area by constituting a group with the representatives from the Ministry of Agriculture, Ministry of Tourism and Antiquities, Natural Resources Authority and the Royal Society for Conservation of Nature.

Co-operation and co-ordination are essential for effective implementation of the action programme. Formulation of the broad-based policy and translating the same into an action programme should be entrusted with the Azraq Land Use Authority. This authority is headed by a chairman and one representative from each interested body operating in the area. The authority is wholly

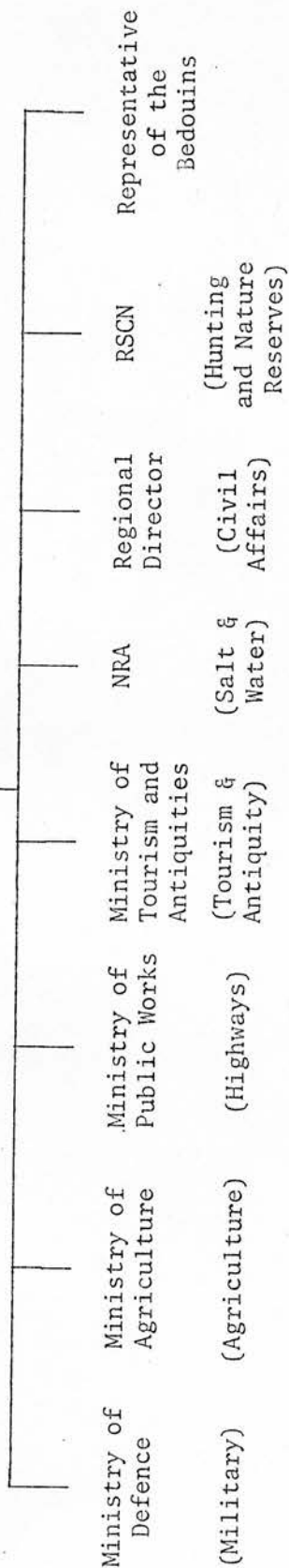
responsible for the implementation of the government policy relating to National Parks, and other land uses by drawing a co-ordinated development programme. The structure of the authority is shown below.

Clarke (1977) has suggested to declare many reserves to the south and to the east of Routes 50 and 5 (see Figure 18) and make over position for management by the RSCN, in addition to the Shaumari Wildlife Reserve and Azraq Waterfowl Reserve. This is not possible at present due to the vastness of the area and the lack of qualified staff and funds. In view of the difficulties already stated it is not desirable to establish many Reserves at one time. The management and supervision of the development work can be better achieved with the existing staff if the extension of the Shaumari Wildlife Reserve, as proposed, is duly considered without incurring extra expenditure towards the salary of the staff. Another Reserve is proposed for the present to protect the resources still available in the area. This Reserve is Hazim-Qattafi Wildlife Reserve (see Figure 19). Further improvement will be undertaken in future depending on availability of trained staff and funds.

These Reserves cover the wadi spread and vegetated areas and therefore form an important component of the resources for the future. They contain good habitat with abundant vegetation capable of supporting large herbivores. Water is available for domestic supplies to the Reserve headquarters and for animals in the Reserve.

A Z R A Q L A N D U S E A U T H O R I T Y

CHAIRMAN



Some of the water points have been established as a facility for pastoralists. They cannot, therefore, be denied access to them. For these reasons the proposed Reserve boundaries do not cut off either of the new water points (Hazim and Qattaf, see Figure 19) but run beside them so that they are available to both pastoralists and the Reserves.

Accessibility to the Reserves should be adequate for management purposes. The problem of access is only on the basalt country. Elsewhere travel by vehicles is easily accomplished and new tracks can be established with relative ease. All these Reserves should be under the auspices of the RSCN. Each Reserve should have a specific management plan.

After fixing the nomadic Bedouin in sedentary cultivation it will be possible to establish more reserves as suggested by Clarke (1977) due to the fact that the pressure on land will be removed immediately after settlement of the Bedouin.

6-5 RECOMMENDATION FOR LEGISLATION AND OTHER ACTIONS

At present there is no National Park Law in Jordan due to the absence of the National Park Policy. Current operations are mostly devoted to protection work. The achievement of good administration in the Azraq Desert National Park will require the following steps to be taken:

6-5.1 National Parks Act

Urgent steps should be taken by the Jordan Government to enact a National Park Law. This would give a legal status to the Azraq Desert National Park and other proposed National Parks in Jordan and protection under the law. In farming law provision for heavy penalties and severe punishment in cases of violation should be made.

The Law should state the intention of the government and the duties and rights of the people. A National Parks Law was drafted in 1975 but was not ratified by the government at that time.

6-5.2 Staffing

It is necessary to create a qualified and trained staff in National Park management. The staff may be trained by sending personnel abroad to countries where training facilities are available.

Hemsley and George (1966) stated that it will be necessary for Azraq Desert National Park to have a specialist Park Officer with extensive experience in developing and managing Parks. The Park Director will delegate responsibility for day-to-day handling of affairs relating to the enforcement of regulations, security, and working contact with the governmental bodies, to the Park officer. The role of the latter will, therefore, in certain aspects be that of Deputy Park Director. The Park Director would, with the help

of the Park Officer, define the duties of the Range-force and would issue clear instructions on daily procedures, especially in matters relating to Park visitors and control of vehicles, range grazing by nomadic pastoralists, and shooting and hunting in the Park.

6-5.3 Financing of the Azraq Desert National Park

The problem of finance has been critically important since the time when the first National Park was created. It was commonly assumed that the new Park would be self-supporting.

At the first stage of establishing any Park the government should pay for the expenses of protection and administration. The government, at this stage, try to attract visitors. In the second stage the pressure of visitors may be reduced by imposing fees so that the resources of the Park are not impaired, in addition to adopting other measures.

Currently the sources of finance in Azraq Desert National Park are from:

1. General Government fund.
2. Supplemented by contributions from international organizations such as UNESCO and UNEP, local and private organizations such as IUCN and WWF which concern themselves with the protection and development of the Parks.
3. Revenue from managing and utilizing the National Park, i.e. entrance fees, car parking fees, and fees for using the road through the Park. These fees might be used to supplement maintenance.

4. Since Azraq Desert National Park is mainly supported by the government, revenue from fines and penalties, which are levied according to the National Park Act, could be returned to the Treasury and might be used for Park improvements.

6-5.4 Establishment of the Azraq Land Use Authority

Urgent steps should be taken to establish the Azraq Land Use Authority which consists of eight representatives from all existing land uses in the Azraq area. This authority would be responsible for the implementation of the Government policy relating to the Azraq Desert National Park and other land uses, by drawing up a co-ordinated development programme.

Finally, urgent steps should be taken to establish a research programme which includes experimental and investigational projects on problems of conservation and on hydrological studies on Azraq Druze and Shishan pools. Studies on the future effect of sewage pollution on water resources of Azraq should be undertaken, as well as on the estimation of the amount of water needed for local and municipal consumption.

Close collaboration between the official bodies concerned and the National Park management should be encouraged.

PART 7

SUMMARY AND CONCLUSION

PART 7 :

S U M M A R Y A N D C O N C L U S I O N

The idea of the National Parks was formulated by the proclamation of His Majesty King Hussein on 26th July 1965.

Azraq Desert National Park was the first National Park to be designated in Jordan. Azraq Desert National Park has not been legally constituted as a National Park status in spite of the great interest of Azraq area. A period of some thirteen years has passed since the proclamation of the Royal decree and there is no legal status or protection for National Parks in Jordan.

Many people outside Jordan have taken the Royal proclamation of interest in the establishment of Azraq Desert National Park to mean that the Park had actually been established by law. This is not so and there is still no National Park Act in Jordan.

The need for an effective conservation and management policy for the Azraq Desert National Park has necessitated the study of National Park management. This investigation has been carried out in seven interconnected parts. The first part was concerned with the description of the various natural features and the land character of the Park. The second part of this

investigation looked at the present land use in the Park. The fieldwork and questionnaire were done in the Azraq Desert National Park in Jordan between May-July 1977, to assess the recreational and the conservational use of the Park. Data were analysed by computer. The results of the Questionnaire are presented in section 2-9.

The evaluation of Azraq Desert National Park for various land uses, as shown in Part 3, leads to the conclusion that Azraq has a good potential value for the establishment of a National Park. An investigation of the interaction between the various land uses within the Park was discussed subsequently in Part 4. It can be concluded that the interactions between the various forms of land use leads to conflicts between them, causing the current problems in the area.

International concepts of National Parks in the U.S.A., U.K., and the IUCN definition, have been discussed in Part 5 as well as the National Park movement in Jordan and how the Azraq Desert National Park has been managed and the main problems which hinder the establishment and management of the Park, such as the different forms of land use, recreation and other problems.

Part 6 of this investigation has covered the objectives of land use. It has made a review and criticism of Hemsley and George's draft management plan of 1966. Also the possibility of

different kinds of administration, IUCN type, multiple-use type, and separate areas from those designated as IUCN Parks have been discussed. Possible solutions to the main problems have been suggested to achieve the objectives and the overall strategies, including the suggestion for zonation of the Azraq Desert National Park as a good approach for administration of the Park area. This is because the Park is full of motion and activity. Recommendations and legislation are outlined to realise the proposed strategy.

Finally, Part 7 is concerned with the summary and conclusions of the thesis.

Recreational facilities for visitors and tourists should be allowed in the Park in a limited sense since the recreational element must take a lower priority to the conservational element in specified areas such as the "Azraq National Park". The Park management should never play a subordinate role to tourism. Tourism may be based upon a well-managed Park system, but not vice-versa. If tourism was put before conservation the resources might become seriously downgraded to the extent that they would eventually lose their tourist appeal, which conservation was originally meant to maintain. In the end neither the Park's nor the tourists' interests will have been served. More action should be made to encourage research programmes in the Park area, especially in the Azraq Oasis. Urgent steps should be taken to enact a National Park law and penalties should be stipulated. Later, when the trained personnel, finance, and the National Parks laws

are available, more intensive permanent management plans could be prepared to cover the whole area of the Azraq Desert National Park. Immediate steps should be taken to establish an Azraq Land Use Authority to represent the interested bodies operating in Azraq Park.

R E F E R E N C E S

- ADAMS, A.B. (1964). First World Conference on National Parks. IUCN, Morges.
- ATALLAN, S.I. (1967). 'Mammalogy', in Boyd (1967).
- BAKER, M. and HARZA ENGINEERING COMPANY. (1958). Princess Alia Project: Definite Plan Report, Azraq.
-
- (1959). Wadi Ratam Irrigation Pilot Scheme, Azraq Area, Summation of Engineers' Reports.
- BESKOK, T.E. (1969). A Plan of Afforestation in Jordan. Final Report. UNDP/FAO, Amman, Jordan.
- BODENHEIMER, F.S. (1960). Animal and Man in Bible Lands. E.J. Brill, Leiden, Netherlands.
- BOURNE, W.R.P. (1959). Notes on Autumn Migration in the Middle East, Ibis, Vol.101, pp.170-176.
- BOYD, J.M. (1965). Enquiries into The Establishment of National Parks in The Hashemite Kingdom of Jordan. Nuffield Travelling Fellowship. The Nature Conservancy, Edinburgh, Scotland.
-
- (1966). International Jordan Expedition. Nature. Vol.212, No.5063, pp.633-665, November 12, 1966.
- BROCKMAN, C. Frank. (1961). Outdoor Recreation in Relation to Nature Conservation in South Africa, S.A.N.U.
- BURDON, D.J. (1959). Handbook of the Geology of Jordan. The Hashemite Kingdom of Jordan, Amman.
- CAMERON, R.A.D. and CORNWALLIS, L. (1966). Autumn Notes from Azraq, Jordan. Ibis Vol.108, pp.284-287.
- CASHMORE, A.B. (1952). Range Management in Jordan. FAO. Mimeo, (1952).
- CHALMERS, C.M. (1974). The Woodlands of the Peak District, their Present Condition and Possible Future. Unpublished M.Phil. thesis, University of Edinburgh.
- CHAPMAN, G.W. (1950). Notes on Forestry in Jordan. British M.E. Office, Cairo.

CLARKE, J.E. (1976a). Quarterly Report for the first quarter of 1976 on Management of Shaumari Wildlife Reserve and re-introduction of animals. RSCN, Amman, Jordan.

————— (1976b). Quarterly Report for the second quarter of 1976. On Management of Shaumari Wildlife Reserve and re-introduction of animals. RSCN, Amman, Jordan.

————— (1976c). A Preliminary Study of Jordan Proposed National Parks. Cyclostyled document produced by the RSCN, Amman, Jordan.

————— (1977a). Shaumari Wildlife Reserve Management Plan. Cyclostyled document produced by the RSCN, Amman, Jordan.

————— (1977b). Review of The Azraq Desert National Park Draft Management Plan. RSCN, Amman, Jordan.

————— (1977c). A Preliminary List of Jordan's Mammals. RSCN, Amman, Jordan.

CRAWFORD, O.G.S. (1929). Antiquity, A Quarterly Review of Archaeology. Notes and News, Ancient Reservoirs near Kasr Azrak, pp.89-92.

DAKHGAN, A.M. and BANDAK, A. (1968). Conservation of Wildfowl Resources in Jordan. RSCN, Amman, Jordan.

DARLING, F.F. (1967). Man and Nature in the National Park. Reflections on Policy. The Conservation Foundation, Washington, D.C.

DEPARTMENT OF BOTANY AND MICROBIOLOGY. (1976). Handbook for the preparation of Management plan for Nature Reserves. Discussion Paper in Conservation, University College, London, No.14.

DEPARTMENT OF ENVIRONMENT. (1974). Report of the National Park Policies Review Committee, (Sandford Report), H.M.S.O., London.

DEPARTMENT OF IRRIGATION AND WATER POWER. (1955). Rainfall in Jordan in the Season 1954-55. Technical Paper No.24, Amman, Jordan.

DEPARTMENT OF STATISTICS. (1975). Annual Report, 1975. The Hashemite Kingdom of Jordan, Amman.

DOWER, J. (1945). Report on National Parks in England and Wales (Cmd.6628), H.M.S.O., London.

EAST LoTHIAN DISTRICT COUNCIL. (1976). John Muir Country Park, Prescriptive Management Plan.

- FEDERAL REPUBLIC OF GERMANY. (1974). The International Conference on the Conservation of Wetlands and Waterfowl (Report), Heiligenhafer, Germany, 2-6 December, 1974.
- FIELD, H. (1925-50, 1960). North Arabian Desert Archaeological Survey. Published by the Peabody Museum, Cambridge, Massachusetts, U.S.A.
- FOSTER, R.R. (1972). Planning for Man and Nature in National Parks. IUCN.
- GARRARD, A.N. and STANLEY, N.P. (1975). A Survey of Prehistoric Sites in The (Azraq Desert National Park), in Eastern Jordan, Annual of the Department of Antiquities, pp.83-88.
- GIBBS, R.F. (1968a). Master Plan for the Protection of Jerash National Park, Amman, Jordan.
- (1968b). Master Plan for the Protection and Use of Petra National Park, Amman, Jordan.
- GLUCK, N. (1970). The Other Side of Jordan. American Schools of Oriental Research.
- GRUNEBERG, F. and DAJANI, F.J. (1963). The Soils of Lower Wadi Er Ratam (Azraq Area), Amman, Jordan.
- HARDING, G.L. (1959). The Antiquities of Jordan. London Lutterworth Press.
- HARE, F.K. (1961). The Causation of the Arid Zone, History of Land Use in Arid Regions, UNESCO, Paris.
- HARRIS, G.L. (1958). Jordan: Its People, Its Society, Its Culture. Government Press, New York.
- HARRISON, D.L. (1964). The Mammals of Arabia. Ernest Benn, London. Vol.1. Insectivora, Chiroptera and Primates.
- (1968). The Mammals of Arabia. Ernest Benn, London. Vol.2. Carnivora, Hyraeioidea and Artiodactyla.
- (1972). The Mammals of Arabia. Ernest Benn, London. Vol.3. Lagomorpha and Rodentia.
- HARROY, J.P. (1972). World National Parks Progress and Opportunities. Hayez, Brussels, Belgium.

- HART, W.J. (1966). A System Approach to Park Planning. IUCN, Morges, Switzerland. New Series: Supplementary Paper No.4.
- HEMSLEY, J.H. and GEORGE, M. (1966). Azraq Desert National Park, Jordan: Draft Management Plan. IBP/CT, London.
- (1976). Ecological Research and Training. Possible Establishment of a Desert Ecological Station. UNESCO, Paris.
- HOADE, Fr. E. (1966). East of the Jordan. Jerusalem Franciscan Printing Press.
- HOIDGATE, M.W. (1971). The National Strategy for Nature Reserves. Vol.3 (4), The Nature Conservancy.
- ISE, John. (1961). Our National Park Policy. John Hopkins Press, Baltimore 18, Md.
- IUCN. (1971). United Nations List of National Parks and Equivalent Reserves. Morges, Switzerland.
- (1974). Second World Conference on National Parks. Morges, Switzerland, 1972.
- (1975). United Nations List of National Parks and Equivalent Reserves. Morges, Switzerland.
- JORDAN CLIMATOLOGICAL DATA HANDBOOK. (1968). Ministry of Transport, Amman, Jordan.
- JORDAN TOURISM AUTHORITY. (1963-1965). Half-Yearly Travel Statistics. Amman, Jordan.
- KASAPLIGIL, B. (1955). The Ecological Survey of the Vegetation in Forest and Grazing Lands of Jordan. FAO/UN.
- KROPP, G. (1971). Wildlife and National Park Legislation in Asia. FAO, Rome.
- LONG, G.A. (1957). The Bioclimatology and Vegetation of Eastern Jordan. FAO, Rome.
- MACGREGOR, J.J. (1962). Conservation and Outdoor Recreation in The United States. Nature, 196, (4860): 1134-1127, December 22, 1962.
- MCCAY, R.E. (1976). Ohio Trail Users. Northern Forest Experiment Station. USDA Forest Service Research, Note NE-228.

- MINISTRY OF TOURISM AND ANTIQUITIES. (1976). Five Year Development Plan, 1976-1980. Hashemite Kingdom of Jordan, Amman.
- MINISTRY OF TOWN AND COUNTRY PLANNING. (1947a). Report of The National Parks Committee (England and Wales) (Cmd.7121), H.M.S.O., London.
- _____. (1947b). Conservation of Nature in England and Wales (Cmd.7122). The Wildlife Conservation Special Committee (England and Wales). H.M.S.O., London.
- MOORMANN, F. (1959). The Soils of East Jordan. Report No.1132. FAO/UN, Rome.
- MOUNTFORT, Guy. (1963). The British Jordan Expedition.
- _____. (1965). Portrait of A Desert. Collins, London.
- MUDALLAL, U.H. (1964). Pumping Test and Aquifer Analyses at Zarqa Municipal Well Field. Typewritten Report, Amman.
- _____. (1967). Water Balance Study in Azraq Area. Natural Resources Authority 1968, Amman, Jordan.
- NELSON, J.B. (1973). Azraq Desert Oasis. Allen Lane, London.
- _____. (undated). Jordan International Biological Station, Azraq. Leaflet, C/o University of Jordan, Faculty of Sciences, Amman, Jordan.
- _____. (undated). The Birds of Azraq.
- NIE, N.H., BENT, D.H., HADLAIHULL, C. (1970). Statistical Package for the Social Science. McGraw-Hill Book Company, New York.
- POORE, M.E.D. and ROBERTSON, V.C. (1964). An Approach to the Rapid Description and Mapping of Biological Habitats. Sub-Commission on Conservation of Terrestrial Biological Communities of The International Biological Programme (IBP), London.
- RATCLIFFE, D.A. (1970-71). Advancement of Science. Criteria for the Selection of Nature Reserves. Vol.17, pp.294-6.
- SCATES, M.D. (1968). Notes on The Hydrobiology of Azraq Oasis, Jordan, Vol.31, pp.73-80. Separatum, The Hague, Belgium.
- SINGHAPANT, S. (1975). The Management Plan for Nature Reserves in Scotland and their Bearing on the Management of National Parks in Thailand. Unpublished M.Phil. thesis, University of Edinburgh.

SOIL RESOURCES DEVELOPMENT AND CONSERVATION SERVICE LAND AND WATER DEVELOPMENT DIVISION. (1976). A Framework for Land Evaluation. FAO, Rome.

STAMP, D. (1969). Nature Conservation in Britain. Collins, St. James Place, London.

T.D.C. NETHERLAND INSTITUTE OF TOURISM DEVELOPMENT CONSULTANT. (1972). Tourism Study Kainji Lake Area and Borgu Game Reserve, Vol.2 Borgu Game Reserve.

TILDEN, F. (1968). The National Parks. New York, Alfred A. Knopf.

UNESCO. (1973). Conservation of Natural Areas and of the genetic material they contain. (MAB), UNESCO, Morges.

——— (1974). Criteria and guideline for the choice and establishment of Biosphere Reserves. Final Report (MAB), UNESCO, Paris.

——— (1977). Mediterranean Forests and Maquis, Ecology, Conservation, and Management (MAB), Technical Note 2, Paris.

UNITED NATIONS BUREAU OF TECHNICAL ASSISTANCE OPERATION. (1964). Azraq Groundwater Project Report, Amman, Jordan.

A P P E N D I X (1)

(A) AGRICULTURE ACT NO. (20) 1973
Second Book - Animal Resources

- Chapter III - Protection of Wildlife and Birds and Organization of their Hunting.
- Article 144 - Hunting of Wildlife and Birds without permission from the Ministry of Agriculture is prohibited. The charges for Hunting Licences shall be determined by the Minister of Agriculture.
- Article 145 - (a) The hunting of useful birds for agriculture, Amended by Act No.14, 1974 or killing or catching them is prohibited, also it is forbidden to possess them, transfer them, or sell them alive or dead.
- (b) The hunting of predatory birds and animals, or catching them in any way, or poisoning them is prohibited without special permission from the Minister of Agriculture.
- (c) The Minister will issue decrees specifying the birds which are protected by this law. Also he will specify the conditions under which they may be hunted for scientific purposes.
- Article 146 - The destruction of birds' nests is forbidden as is the collection of their eggs, damaging their eggs, and/or injuring their young.
- Article 147 - The Minister will be responsible for determining hunting areas and periods and the type of wildlife and birds which may be hunted.
- Article 148 - (a) It is forbidden to use vehicles and flash lights or automatic guns in connection with the hunting of birds and wildlife.
- (b) It is forbidden to use military rifles in hunting wild animals with the exception of the animals specified by the Minister.

- Article 149 - It is prohibited for foreign hunters who are normally resident outside the Kingdom to hunt birds and wild animals inside the Kingdom without permission from the Ministry of Agriculture.
- Article 150 - Cruelty to animals is forbidden.
The Minister issues decrees to specify the conditions under which these decrees are applicable.
- Article 151 - (a) It is not allowed to import guns (sebesten) and sticking materials (which is used to catch birds) or selling it or keeping it or using it.
- (b) It is not allowed to use any sort of traps to catch birds.
- (c) It is not allowed to hunt birds by using camouflage instruments - banner, animal skin, or calling instruments or a hide, e.g. hut and shanty.
- (d) Anaesthetics are prohibited for hunting birds and wild animals.
- (e) Wildfowl are excluded from these by-laws.
- Article 152 - The Minister shall appoint a committee called the Hunting Committee to advise on the regions and times of hunting and the kind of birds and animals to be hunted and any other affairs which concern the wildlife.
- Article 153 - Anyone who violates the rules set out in this Chapter is liable to a fine which is not less than:
- a. 15 Jordan Dinar for every desert Gazelle.
b. 10 Jordan Dinar for every Wild Boar or Mountain Gazelle or Bustard.
c. 3 Jordan Dinar for every animal or bird.
- Article 154 - (a) In case of usage of vehicle contrary to Article 148 or any other decrees, the driver is fined an amount not less than 15 Jordan Dinar and the owner of the vehicle is fined the same amount if he is aware of the infringement, in addition to the penalties stated in Article 153.

Article 154 - (b) If the violation is repeated within a year
(cont.) the penalty is doubled and the weapons
are confiscated.

(c) In addition to penalties stated in
Articles 153, 154, the weapons used
are confiscated under the following
conditions:

1. Hunting without valid licence.
2. Hunting in prohibited regions.
3. Hunting at prohibited times.

Article 155 - Officials of the Ministry of Agriculture,
members of general security, members of
Armed Forces and the personnel appointed
by the Minister outside the staff of the
Ministry are requested to arrest all those
who violate the rules of this chapter and
hand them over to the nearest police
station after preparing a report.

23/4/1973.

(B) 1973 ACT No. 113

Act for Protection of Birds and Wildlife and
Rules Governing their Hunting.

Issues by Article 199 from 1973 Agricultural
Act No. (20).

- Article 1 - This Act is called (Act for Protection of Birds and Wildlife and Rules Governing their Hunting, 1973) and it shall come into force from the day it is published in the Gazette.
- Article 2 - Hunting licences are issued to Jordanian and foreigner residents upon the payment of three Jordanian Dinar according to the following rules:
- (a) The licence should bear the hunter's photograph.
 - (b) The licence is not transferable.
 - (c) The licence is valid for one year from the date of issue.
 - (d) The licence must be presented to any official or person delegated to carry out the Agricultural Act, on request.
- Article 3 - Foreign hunters, who are not resident in the Kingdom, may be issued temporary hunting licences valid for three days, upon payment of the sum of five Jordanian Dinar.
- Article 4 - The hunting of wildlife and birds is only permitted in those areas and at those seasons specified by the Minister, from time to time, in the Gazette.
- Article 5 - All kinds of hunting are forbidden in the desert region east of Hijazi railway line with the exception of the Azraq region and any other regions specified by the Minister in the Gazette on the recommendation of the Hunting Committee.
- Article 6 - Hunting of Ibex and Mountain Gazelle in the regions west of Hijazi railway line shall be controlled according to the rules specified by the Minister in the Gazette on the recommendation of the Hunting Committee.

Article 7 - Permission is given to hunters who carry licenced weapons and valid hunting licences to hunt the wildlife and birds listed below in the seasons and regions permitted for hunting at times specified under Article 4 of this Act on condition that the number of animals shot and the frequency of hunting do not exceed the specified limits.

| Type of Hunt | Latin Name | Number Permitted | Times Permitted in a Year |
|-------------------|--------------------------------|-----------------------------------|---------------------------|
| Wild Boar | <i>Sus scrofa</i> | One | Twice |
| Ibex | <i>Capra ibex</i> | One | Twice |
| Gazelle(Mountain) | <i>Gazella gazella arabica</i> | One | Twice |
| Arabian Hare | <i>Lepus arabeus arabicus</i> | Three | Many times |
| Honey Badger | <i>Mellivora capensis</i> | One | Three times |
| Reem(Desert G.) | <i>Gazella leptoceras</i> | Forbidden to hunt around the year | |
| Houbara Bustard | <i>Chlamydotis undulata</i> | Two | Three times |
| Sand Partridge | <i>Ammoperdix heyi</i> | Six | Many times |
| Wood Pigeon | <i>Columba palumbus</i> | No limit | Many times |
| Dunlin | <i>Calidris alpina</i> | Thirty | Many times |
| Starling | <i>Sturnus vulgaris</i> | Thirty | Many times |
| Stock Dove | <i>Columba livia</i> | Twenty | Many times |
| Duck | <i>Aythya spp.</i> | Twenty | Twice a week |
| Swan | <i>Anas spp.</i> | One | Twice a week |
| Coot | <i>Fulica atra</i> | Ten | Twice a week |
| Quail | <i>Coturnix coturnix</i> | Twenty | Many times |
| Field Fare | <i>Turdus pilaris</i> | Twenty | Many times |
| Sand Plover | <i>Charadrius mongolus</i> | Three | Many times |

Article 8 - Cancelled Hunting Act No. 47 for 1972 and any other Act the contents of which is contrary to the content of this Act.

A P P E N D I X (2)

National Parks Draft Law for Protection of Natural Sites of Civilization and National Heritage 1975

- Article 1 - This Bye-law is called "The Bye-law of the National Parks for Protection of Natural Sites of Civilization and National Heritage" of the year 1975, and it becomes valid from the date of publication in the official Gazette.
- Article 2 - The following words shall have these meanings unless otherwise specified:
- | | | |
|--------------------|---|--|
| The Minister | : | means Minister of Tourism and Antiquity. |
| The Department | : | means National Parks Department in the Ministry of Tourism and Antiquity. |
| The Director | : | means Director of National Parks Department in the Ministry of Tourism and Antiquity. |
| The National Parks | : | means any area of land, water, beach or Oasis, or forests, or buildings or historical sites which the Council of Ministers decide their name, boundary or amending it and designate as National Parks due to their natural beauty or their archeaological and historical importance or their rarity characteristics for their contents of fauna and flora for the purpose of keeping it, regulating it and limiting the method of its use. |
| The Declaration | : | means naming and designation of areas and particular historical locations for National Parks purposes. |
| The Committee | : | means Committee of Co-ordination, consultative which has been formed according to this Bye-law. |

- Article 3 - (a) The department is given the responsibility for protecting, keeping, regulating, administering, developing and getting benefits from the National Parks according to the contents of this Bye-law and any Acts issued accordingly, on condition that not to decrease its value during a stretch of time.
- (b) The Minister could authorize to any body which has similar interests of protection of National Parks, regulate or to get benefits from the National Parks.

- Article 4 - (a) The Committee set up with the Minister as Chairman and the following as members:
1. Director General of Tourism.
 2. Director General of Antiquity Department.
 3. Director General of Forests Department.
 4. Secretary General of the National Planning Council.
 5. The President of the Royal Society for Conservation of Nature.
 6. Director General of Natural Resources Authority.
 7. The Under Secretary of the Ministry of the Interior for Rural and Municipality Affairs.
 8. Director of Land and Survey Department.
 9. A representative of Jordanian University.
 10. Two experienced members to be appointed by the Council of Ministers with the approval of the Minister for a renewable two years.
- (b) The Director takes over the Permanent Secretary of the Committee.
- (c) The Minister could choose any member to Chair the Committee on his behalf when he is absent.
- (d) The Committee meets when it is called upon by the Chairman, and the legal completion occurs when the Chairman is present and most of the members. Decisions are taken by a majority vote of those present and the Chairman has the casting vote (deciding vote).
- (e) The Committee provide the technical consultative schemes, recommendation concerning designation of National Parks locations, declaration and how to develop it, administer it, organize it, develop it and all these decisions are presented to the Council of Ministers for decisions on them.
- (f) The Committee could get advice from any one or experts concerning its work.

Article 5 - The following steps should be taken for the purposes of National Parks declarations:

- (a) The Department demarcate the desirable areas and sites to declare as a National Park and make a detailed report concerning them.
- (b) The Committee meets to discuss the study and the report and to make their decision and raise recommendations to the Ministers Council for their decisions.
- (c) The Department prepares a Draft Act to specify the general plan for each National Park which has been declared and this Draft includes the following:
 - 1. How to protect, keep and regulate the National Park.
 - 2. How to manage the National Park.
 - 3. How to develop and utilize the National Park.
 - 4. The Department decides the fees from the National Park and fines of which is contrary to the content of this law and any other Acts issued according to it.
 - 5. To determine the responsibility of the executive body to this general plan.
- (d) The Committee can study the Draft Act and submit its recommendations to the Council of Ministers for its decision.
- (e) If the detailed general plan needs the undertaking of some works which fall under its responsibilities or rights of any body, then this should require an agreement between the Department and that body to safeguard the execution of this law. In the case of disagreement the matter should be raised with the competent authority who will issue the relevant decision.

Article 6 - The financing sources of the National Parks consist of the following:

- 1. The General Government Budget.
- 2. Fines and fees which are levied according to the law or Act derived from this law.
- 3. Revenues from managing and utilizing the National Parks.
- 4. Revenues from international and local activities concerned with the protection and development of National Parks.
- 5. Any other resources which the Council of Ministers agree upon, based on the recommendation of the Minister.

- Article 7 - Any one who contravenes the contents of this law or the Acts derived from this law will be prosecuted and he is liable to be fined by not less than J.D.50 and not more than J.D.300, or arrested for a period not less than two weeks and not more than six months, or both penalties.
- Article 8 - According to the recommendation of the Minister, the Council of Ministers issue the necessary Acts according to the contents of this law.
- Article 9 - The Prime Minister and the appointed Ministers are requested to execute the contents of this law.